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A. O. J. KELLY, M.D.

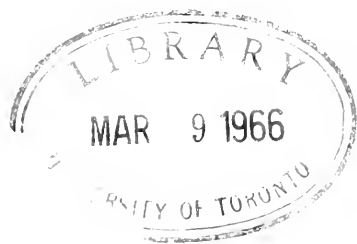
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SPECIAL ARTICLE.

FURTHER OBSERVATIONS ON THE ANATOMY OF THE
DUODENUM.

By A. J. OCHSNER, B.S., F.R.M.S., M.D.

SURGEON-IN-CHIEF TO THE AUGUSTANA HOSPITAL AND ST. MARY'S HOSPITAL, CHICAGO;
PROFESSOR OF CLINICAL SURGERY IN THE MEDICAL DEPARTMENT OF THE
UNIVERSITY OF ILLINOIS, CHICAGO.

ONE year ago I directed attention to an anatomical condition of the duodenum, which consists in a marked thickening of the circular muscle fibres of this portion of the alimentary canal at a point below the entrance of the common duct. This was proved by a large number of dissections.

A considerable variation was found in the exact position of these muscle fibres. In some instances they were arranged in a narrow circular band forming a distinct sphincter; in other instances the thickening was diffused, making a broad, circular band; and in a few instances the thickening was in two different bands, with an intervening portion in which the circular muscle fibres were of the same thickness as the remaining portion of the duodenum.

There was a further difference in the location of this duodenal sphincter; in most specimens it was located from 3 to 10 c.c. below the point of entrance of the common duct, while in a few instances a portion of the sphincter included a point of entrance of the common duct, the remaining portion, however, being always located below this point.

This arrangement of circular muscle fibres was shown by a number of drawings made of the exact size of specimens when they were taken from the cadavers.

These conditions seem to explain a number of physiological facts: the fact that vomiting when the stomach is relatively empty always expels a certain amount of bile; and the fact that in many cases in which there is a dilatation of the stomach without constriction of the pylorus, with an ulcer in the pyloric end, the ulcer frequently extends into the duodenum. It may also explain some of the stomach symptoms which are so constantly observed in connection with gallstone disease. It will also explain a condition not infrequently encountered in operating for the relief of gallstones and ulcer of the stomach; that is, the presence of a greatly distended duodenum, with a completely contracted first portion of the jejunum.

It also explains the presence of the bile-staining of the portion of the duodenum above the common duct in the cadaver, while the portion below this point is usually free. This condition has been noted by many observers.

It has seemed to me as though this arrangement of circular muscle fibres served the purpose of a sphincter to facilitate the process of mixing the bile and the pancreatic juice in the duodenum; which has been so perfectly described by Dr. Walter B. Cannon.¹

The presence of a gastric ulcer in a considerable proportion of patients that have suffered from chronic appendicitis may have some relation to this condition in the following manner: there is undoubtedly an obstruction of the ileocaecal valve, due to the physiological contraction of this sphincter during an acute exacerbation of appendicitis, for the purpose of establishing a condition of rest in this vicinity. This is followed by nausea and vomiting, and it seems reasonable to suppose that the ileocaecal valve initiates return peristalsis and that this in turn excites a contraction of the duodenal sphincter and the pyloric sphincter, and that in this way a normal passage of food from the stomach into the intestines is interfered with, causing an accumulation of residual food in the stomach, and that the irritation caused in this manner may be an etiological factor in the production of gastric ulcer. It may also explain the presence of bile in the vomitus of patients suffering from intestinal obstruction.

During the past year Dr. John T. Finney² and Dr. William J. Mayo³ have referred to this condition in their writings, and I have added a few cases to my list published one year ago, which I will report in this paper.

Since the publication of my last paper my assistant, Dr. E. W. Thuerer, has carefully examined the duodenum of twenty-nine cadavers in the dissecting-room of the Medical Department of the University of Illinois, and has confirmed the observations made

¹ *Annals of Surgery*, May, 1905.

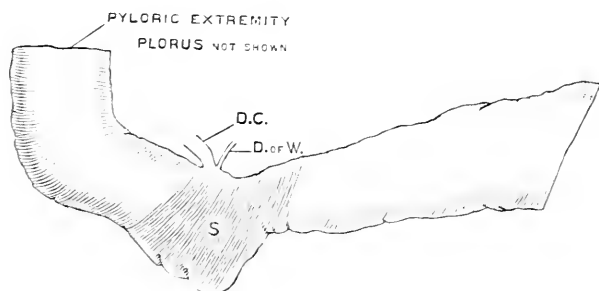
² *Dilatation of the Duodenum*, Boston Medical and Surgical Journal.

³ *Jour. Amer. Med. Assoc.*, October 12, 1905.

last year. He has made full sized drawings of twelve duodeni of all the varieties in arrangement of muscle fibres that he has encountered during this year—choosing the most typical specimens of the entire number examined.

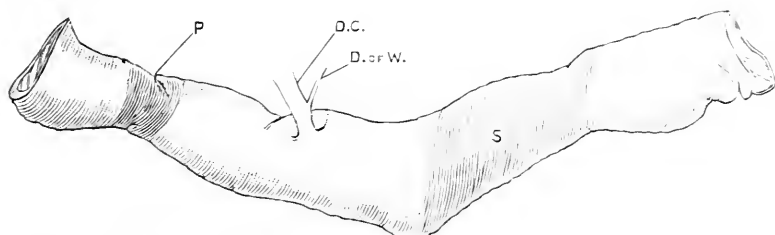
I reproduce herewith eight of these drawings (Figs. 1 to 8), each with its accompanying description. It seems to me that a study of the arrangement of circular muscle fibres of the duodenum is of sufficient importance to demand some attention. In the meantime we have made a study of other anatomical facts connected with this intestine, but confine this report to this one feature espe-

FIG. 1



Specimen showing a single sphincter beginning at a point even with the upper margin of the entrance of the common bile duct and extending downward 3 cm: D. C., common duct; D. of W., duet of Wirsung; S., sphincter.

FIG. 2



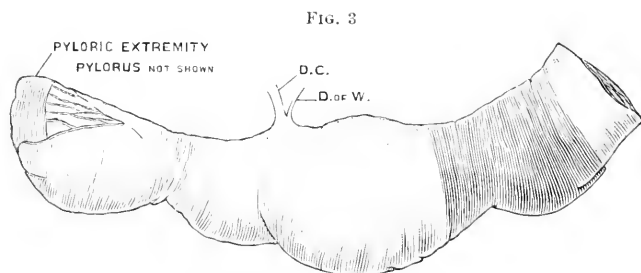
Specimen showing a broad sphincter 4 cm. below the entrance of the common bile duct: D. C., common duct; D. of W., duet of Wirsung; S., sphincter; P., pylorus.

cially, because it seems to have been almost completely neglected in the studies which have been made of this portion of the alimentary canal.

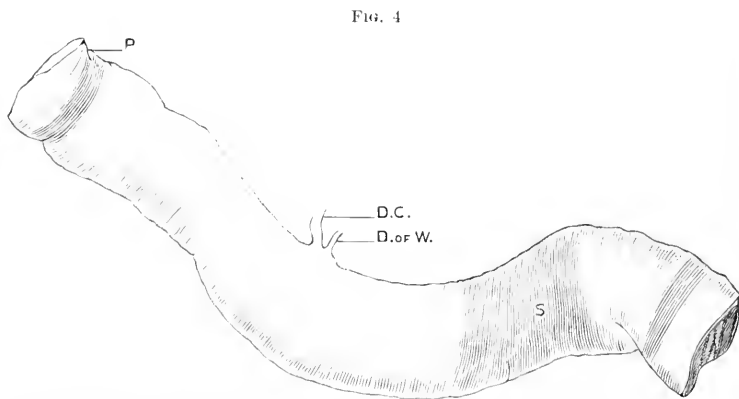
We have made a series of observations in a number of the lower animals, including the cat, dog, pig, guinea-pig, rat, chicken, and pigeon, which seems to point toward some interesting anatomical facts connected with the duodenum of the herbivorous and carnivorous animals. It will, however, require a much larger number of observations than have been made at the present time to warrant definite conclusions. We will consequently defer a consideration of this portion of the subject until some future time.

I append a synoptical statement of the case histories of sixteen patients operated upon during the last year, in whom there was dilatation of the upper portion of the duodenum.

CASE XV.—Female, aged forty-eight years. *Symptoms:* pain in epigastrium, radiating to the back; slight tenderness in the epigastrium. Was operated upon for gallstones and appendicitis four years previously. *Diagnosis:* gastric ulcer; cholecystitis. *Operation,* May 26, 1905; pylorotomy; cholecystostomy. The pylorus



Specimen showing a broad sphincter 4 cm. below the entrance of the common bile duct, with marked dilatation of the duodenum above this point: D. C., common duct; D. of W., duct of Wirsung.



Specimen showing a broad sphincter 5 cm. below the entrance of the common bile duct: D. C., common duct; D. of W., duct of Wirsung; P., pylorus; S., sphincter.

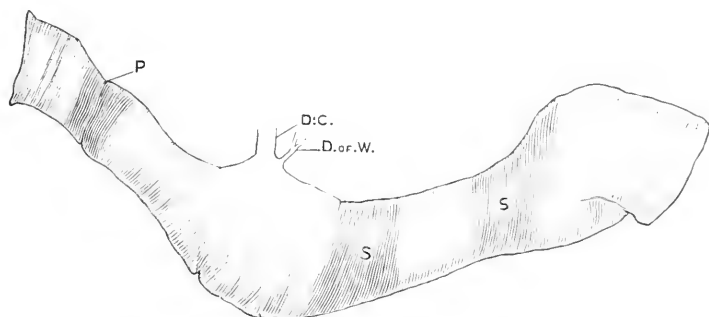
was adherent to the omentum, and the omentum to the anterior abdominal wall; there was a scar of an old ulcer on the posterior wall of the stomach; the duodenum was dilated, and the jejunum contracted.

CASE XVI.—Female, aged sixty years. *Symptoms:* constipation and diarrhœa; excessive abdominal distention. *Diagnosis:* cholecystitis; intestinal obstruction. The patient had also multiple cysts of the left kidney. *Operation,* August 4, 1905; cholecystostomy. The peritoneal cavity contained free bile; there were bands

of adhesions between the omentum and the large bowel; the duodenum was enormously distended.

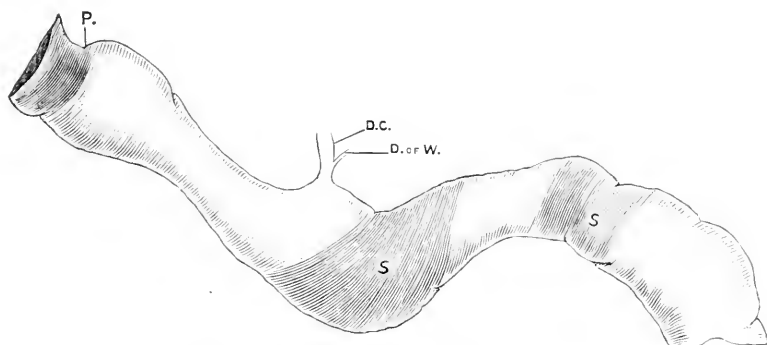
CASE XVII.—Female, aged twenty-nine years. *Symptoms*: burning pain in the epigastrium; frequent vomiting; palpitation of the heart; tenderness in the upper epigastrium. *Diagnosis*: gastric ulcer; appendicitis. *Operation*, August 24, 1905; appendectomy. The point of the appendix was adherent to the uterus, and its distal end contained green pus; there was a chronic ulcer at the pylorus; the duodenum was enlarged.

FIG. 5



Specimen showing two narrow sphincters: D. C., common duct; D. of W., duct of Wirsung; S. S., sphincters; P., pylorus.

FIG. 6



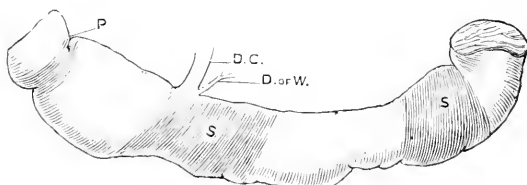
Specimen showing two sphincters with an interval of 3 cm.: D. C., common duct; D. of W., duct of Wirsung; S. S., sphincters; P., pylorus.

CASE XVIII.—Female, aged forty-five years. *Symptoms*: epigastric pain, vomiting, and jaundice; pain in the left epigastrium; slight tenderness over McBurney's point. The patient had been operated upon for gallstones two years previously; there was relief for a short time; then recurrences of the symptoms. *Diagnosis*: cholecystitis; pancreatitis. *Operation*, August 28, 1905; cholecystostomy. There was thick mucus in the gall-bladder; the pancreas was nodular; the duodenum was dilated.

CASE XIX.—Female, aged eighteen years. *Symptoms:* loss of appetite and of weight. A gastroenterostomy had been done one year previously. Tenderness persisted at the upper end of, and one inch above, the incision. *Diagnosis:* gastric ulcer; dilated duodenum. *Operation,* August 28, 1905; enlarged the opening of the previous gastroenterostomy; anastomoses of the previous gastroenterostomy. The duodenum was greatly distended.

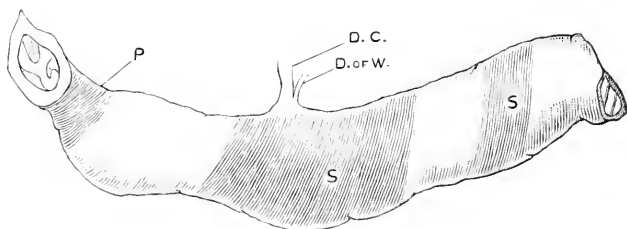
CASE XX.—Female, aged twenty-eight years *Symptoms:* previous nervousness and stomach trouble. Now complains of variable appetite, palpitation in the epigastrium, tenderness in the centre

FIG. 7



Specimen showing one broad sphincter just below the entrance of the common duct and a second sphincter 5 cm. farther down: D. C., common duct; D. of W., duet of Wirsung; S. S., sphincters; P., pylorus.

FIG. 8



Specimen showing a broad sphincter beginning 1 cm. above the entrance of the common bile duct and extending 3.5 cm. below the duct, and a narrow sphincter 2 cm. lower down: D. C., common duct; D. of W., duet of Wirsung; S. S., sphincters; P., pylorus.

of the epigastrium, constipation, and nervousness. *Diagnosis:* gastric ulcer. *Operation,* August 23, 1905; gastroenterostomy. There was an ulcer in the region of the pylorus; the gall-bladder was empty; the duodenum was congested.

CASE XXI.—Female, aged fifty-eight years. *Symptoms:* burning pain in the epigastrium; constant nausea; vomiting and abdominal tenderness, especially marked in the epigastrium. A hysterectomy had been done six years previously. *Diagnosis:* gastric ulcer; dilated duodenum. *Operation,* August 28, 1905; pylorotomy; gastroenterostomy. An ulcer was found near the pylorus; the duodenum was dilated; there was a small nodule in the fundus of the gall-bladder.

CASE XXII.—Male, aged thirty-seven years. *Symptoms:* pain in the hypochondrium extending to the back and shoulders; fever. Examination of the abdomen was negative. *Diagnosis:* cholecystitis; dilated duodenum. *Operation,* October 11, 1905; cholecystostomy. The gall-bladder contained sandy fluid; the duodenum was dilated; the appendix was held by recent adhesions.

CASE XXIII.—Male, aged sixty-four years. *Symptoms:* epigastric distress; bloating; constipation; tenderness above umbilicus; emaciation; anæmia. *Diagnosis:* ulcer of the duodenum. The patient also had a right inguinal hernia. *Operation,* October 25, 1905; pylorotomy. The scar of an old ulcer extended a short distance into the pancreas and the duodenum—probably carcinomatous; the duodenum was dilated below the ulcer.

CASE XXIV.—Female, aged twenty-seven years. *Symptoms:* gaseous distention of the abdomen; constant pain; vomiting; definite and excessive tenderness in the middle of the epigastrium. *Diagnosis:* gastric ulcer; cholecystitis; appendicitis. *Operation,* November 17, 1905; gastroenterostomy; appendectomy. There was an ulcer on the posterior wall of the pylorus extending into the duodenum; the gall-bladder was distended with 15 c.c. of black, sandy bile; the duodenum was dilated; the appendix was adherent to the right ovary, and was distended with fluid.

CASE XXV.—Male, aged forty-four years. *Symptoms:* pain in the epigastrium after eating; rigidity of the abdomen; anæmia; emaciation. *Diagnosis:* ulcer of the stomach. *Operation,* November 27, 1905; gastroenterostomy. An ulcer, 15 cm. in diameter, was located in the cardiac and posterior wall of the stomach; the duodenum was dilated; the lymphatics were enlarged.

CASE XXVI.—Female, aged twenty-four years. *Symptoms:* gastric pain; nausea; hæmatemesis; attacks of colic; extreme tenderness in the middle epigastrium. *Diagnosis:* gastric ulcer; cholecystitis. *Operation,* November 27, 1905; gastroenterostomy. There was a wide open ulcer opposite the entrance of the common duct; the pylorus and the duodenum were dilated; the gall-bladder was distended, and contained 50 c.c. of black, sandy bile.

CASE XXVII.—Female, aged twenty-seven years. Severe pain in the abdomen; vomiting; fever; tenderness beneath the right costal margin and over McBurney's point; neurasthenia. *Diagnosis:* ulcer of the stomach and the duodenum. *Operation,* December 15, 1905; gastroenterostomy; appendectomy. There was an ulcer of the duodenum; the stomach was dilated, and twisted on itself, and contained considerable fecal matter.

CASE XXVIII.—Male, aged thirty years. *Symptoms:* abdominal pain; general abdominal sensitiveness; insomnia. *Diagnosis:* gastric ulcer. The patient has been operated upon, five years previously, for appendicitis and intestinal adhesions. *Operation,* December 15, 1905; gastroenterostomy. There was an ulcer on the

posterior wall of the pylorus on the duodenal side; the stomach and the duodenum were dilated.

CASE XXIX.—Female, aged thirty-five years. *Symptoms:* pain in the right iliac region; abdominal distention; fever; anæmia. *Diagnosis:* gastric ulcer; cholecystitis. *Operation,* December 13, 1905; gastroenterostomy; appendectomy. There was an ulcer near the pylorus; the duodenum was distended; the gall-bladder was distended with 10 c.c. of black, sandy fluid; the appendix was cicatricial, 4 cm. long.

CASE XXX.—Female, aged thirty-eight years. *Symptoms:* continual pain in the stomach; tenderness in the epigastrium; hæmatemesis; headache. A gastroenterostomy had been done six months previously. *Diagnosis:* pyloric ulcer; dilated duodenum; cholecystitis. *Operation,* December 29, 1905; cholecystostomy. The pylorus was indurated; the duodenum was enlarged and adherent.

CASE XXXI.—Female, aged twenty-nine years. *Symptoms:* continual gastric pain; epigastric tenderness. The patient had been operated upon one year previously for gastric ulcer. The pain recurred. *Diagnosis:* pylorospasm; dilatation of the duodenum. *Operation,* January 1, 1905; gastroenterostomy—the opening enlarged. The gastric side of the pylorus was constricted; the duodenum was dilated.

ORIGINAL ARTICLES.

THE SUFFICIENCY OF SIMPLE INTERCOSTAL INCISION IN ACUTE EMPYEMA, WITH A REPORT OF FIVE CASES.

BY JAMES FARQUHARSON LEYS, M.D.,

SURGEON, U. S. NAVY.

Now and then, in a case of flat chest, it will be found that an intercostal space affords an opening too narrow for adequate drainage of an acute empyema, and a piece of rib must be excised. Such cases are exceptional. In cases of empyema which have become chronic and in which it is evident that adequate drainage cannot be secured without excision of a portion of one or more ribs, the propriety of rib resection is not to be questioned. Such removal of bone is required in cases in which it has become evident that lung expansion does not proceed and cannot be hoped for as an effective aid in the expulsion of pus. Where the chronic empyema is very extensive and there is no expansion, or only a slight ineffective expansion with no improvement, one of the extensive excisions first brought forward by Estlander and Schede is indicated; the lung being firmly

fixed in its contracted position by adhesions and failing to expand to meet the chest wall, the chest wall must be enabled to fall in and meet the lung as the only way of securing the obliteration of the pus cavity. These somewhat formidable looking operations have been remarkably successful in suitable cases and their place in surgery is well established.

So well established, indeed, is the operation of rib resection in suitable cases of empyema, that it has come to be the first operation thought of by most practitioners as soon as the diagnosis has been established. The operation which involves a removal of bone has somehow taken a dominant position in the minds of medical men, and the operation which is as much simpler, as it is more suitable in the majority of acute cases, is too often lost sight of.

When suppuration supervenes in what was originally, and has for some considerable time remained, a serofibrinous pleurisy, or when the clear or slightly turbid fluid of a tuberculous pleurisy at last becomes frankly purulent, the lung has been long contracted, in many cases its elasticity has been permanently impaired, thick coagula are deposited upon the walls of the pleural pus cavity, and firm adhesions already exist, preventing expansion of the lung. In such cases of subacute and chronic empyema, rib resection will probably be required to secure adequate drainage.

Probably the majority of cases of empyema, however, are acute in their origin and course, the condition being a sequel of an acute infectious disease. Purulent pleurisy is thus a common sequence of scarlet fever and typhoid fever, and a rarer one of measles and whooping cough. It has its origin sometimes, of course, in a penetrating wound of the chest or some other surgical injury. But in a very large proportion of the cases, probably the majority, acute empyema is a sequel of pneumonia, and invasion of the pleura by the pneumococcus constitutes in such cases the dominant if not the sole infection which is its cause. The majority of the acute empyemas seen in family practice by the medical man are of this class.

It is not the purpose of this paper to bring any new fact to the notice of the profession, but to repeat and emphasize a fact which was long ago established but which for some reason seems to be periodically lost sight of; and this is that the best treatment for such cases, as soon as the diagnosis of empyema has been made on the signs and symptoms and confirmed with the exploring needle, is *simple incision through an intercostal space*.

The failure of the profession in general and the family practitioner in particular to realize this may be referable to one or another of several reasons. First, the man whose work is almost entirely medical and who is not accustomed to do any surgical work beyond the suturing of wounds and the opening of superficial abscesses cannot quite bring himself to think of thoracotomy as the minor operation which it really is. He has a feeling that in promptly

opening the thoracic cavity he would be undertaking alone a grave operation in which he ought to have the benefit of consultation and assistance. If, entertaining these doubts, he turns to the literature for help in clearing up his ideas before proceeding farther in the case, his confidence in the efficacy of the simple operation, and in his own ability to perform it without at least some special instruments or materials not contained in his bag, is apt to be still further shaken by what he reads. In some standard text-books published within the past five years resection of bone in all cases, acute as well as chronic, is represented as advisable without, apparently, any weighty or valid reason for such an opinion.

The reasons sometimes stated are (1) that the removal of a small piece of rib will enable the operator to introduce a finger into the pleural cavity and break up any adhesions encountered, thus favoring drainage; and (2) that the chest wall will be enabled to collapse to a certain extent and meet the lung in the obliteration of the pus cavity. Against these alleged advantages it must be said (1) that in the acute empyemas following immediately upon lobar pneumonia pleural adhesions have not commonly formed; and if adhesions have formed, those encountered and broken up by the exploring finger might well be those at the margin of the pus cavity concerned in limiting its extent and in no way interfering with drainage, and their breaking up could only be harmful as permitting further extension of the suppurative process in the pleura. And (2) the removal of a few inches of one rib does not enable the chest on the affected side to fall in to any considerable extent, and a resection sufficient to bring about such collapse and consequent permanent deformity is not necessary to the cure of these acute cases and, therefore, not to be desired. Furthermore, in cases in which the pneumococcus is not the sole or even the dominant infecting organism, but in which there is a mixed pyogenic infection, sometimes of a specially virulent type, osteitis or periostitis has resulted in the bone exposed by an unnecessary resection in several reported cases.

In most of the literature of the past fifteen years some special forms of apparatus, intended to exclude air, or to secure drainage by siphonage or suction, or to provide for irrigation of the cavity, are described as desirable. It may be readily conceded that there is no objection to the use of specially contrived drainage tubes, single and double, long and short, flanged to prevent their recession into the chest, or provided with siphon attachments, if such contrivances as these are at hand. But they are seldom at hand outside of a hospital, and in any and all cases they are quite unnecessary. If because of a fancied necessity for some such appliances, or a mistaken belief that simple thoracic incision is not a sufficient and effective operation, or a fear that it is too serious a one to be undertaken unaided, or because of a lack of practice in and a feeling of timidity toward surgical procedures in general, or for any other reason,

the isolated medical man hesitates in these acute empyemas, his hesitation will be confirmed when he encounters reports of cases in which pleural collections of pus have been happily absorbed and complete recovery has ensued without surgical interference. By these reports he will be still further enabled to justify his hesitation to his own conscience and be encouraged to hope that this excessively rare outcome may ensue in the case which he has on his hands.

Resection of a rib, then, as already stated, is not only quite unnecessary, but positively undesirable in practically all acute empyemas. Before the profession arrived at a rational treatment of acute empyema by simple incision for the evacuation of pus, two other erroneous ideas, entertained at first on theoretical grounds, had to be abandoned. One was that the opening must be so made and dressed as to prevent the entrance of air; the other, that irrigation of the cavity with an antiseptic fluid would disinfect it and was necessary to advance the cure. These errors, being apparently based on sound theory, died hard. As regards the exclusion of air from the cavity the idea that this was necessary was based on a false physiological teaching that the expansion of the lung depended entirely on the maintenance of the pleural vacuum. It is now well known that the lung has a natural tendency to expand, and if its tissue be not seriously diseased it will exercise this vital function of expansion against a normal atmospheric pressure outside, if not forcibly prevented from doing so. Air exclusion was later insisted on as necessary to prevent fresh infection of the pleura by germs which would be carried in. This argument belonged to the era when antiseptic theory had taken a firm hold on the profession but a rational antiseptic practice had not yet been developed. It was of the era in which operations were performed and babies delivered under the carbolic spray. We now know that pus may be allowed to flow out freely and air to enter as freely, through an open drainage tube between the ribs, with no likelihood that the entering air, strained through an ample dressing of many layers of gauze which had been sterilized by heat and wrung out of bichloride solution, will introduce any fresh infection. The notion that antiseptic irrigation of the cavity could be effective for its disinfection was based upon an erroneous idea as to the penetrating and germ-destroying power of a weak antiseptic solution in brief contact with the surface of infected tissues. Not only is its disinfectant power insignificant under such circumstances, but in irrigation a pressure is apt to be exerted by the liquid, the effect of which is to distend the contracting cavity repeatedly to its original dimensions, to prevent the formation or the permanency of new adhesions and the holding by them of ground gained in the reduction of the cavity; and even, if too great a hydrostatic pressure be unintentionally brought to bear in the use of the syringe or the column of liquid used in irrigation, to make a harmful compression on the

expanding lung. Convulsions and sudden collapse have resulted in a number of instances.

Simple intercostal thoracotomy has been successfully performed since the time of Hippocrates and has shown itself again and again to be an adequate operation for acute empyema; and it is unaccountably strange how this fact has gained a temporary recognition only to be forgotten again while the profession groped in a confusion of ideas and in efforts to elaborate and improve surgical procedures which were as much more complicated as they were less suitable. It is interesting to trace this fact through the literature of the past two hundred years or so. In the midst of unsuccessful attempts to deal with pus in the chest by other and more elaborate procedures, someone would treat a case by simple incision. Recovery would follow, the profession would be surprised, report the case as something remarkable, and go on with aspirations, siphons, valve-like incisions, irrigating apparatus, special forms of drainage tubes, and repeated failures to deal successfully with the disease.

Thus going back to 1694, a time anterior to the beginnings of modern surgery, when the surgeon was practically a non-professional man, we find an account by Riedlinus,¹ a German physician, of a case of empyema which he treated with medicaments and with the cautery. A leech or surgeon was at last called in to bleed the patient. Though the chronicler does not think it worth while to mention the leech's name, he appears to have been a better man than his principal. His ministrations were certainly worth more to the patient. Noting intercostal swelling he made a free incision through the right fifth interspace, which was followed by the evacuation of a total of ten pints of pus within a short time following and complete cure within seven weeks. Warner,² of Guy's Hospital, London, in 1751, made a three-inch incision in the tenth interspace four inches from the spine, in a man of twenty-seven years, placing the patient in a sitting posture, and evacuated twenty ounces of pus. Recovery was perfect in six weeks. Isaac Rand,³ of Cambridge, Mass., in 1756, in a case of empyema in a blacksmith, incised an intercostal space, evacuating five pints of pus at the time. He states that "the abscess and the external opening healed in sixteen days and he recovered his usual state of health." In 1783, twenty-seven years later, the man was still following his business as a blacksmith.

Such satisfactory results from so simple a procedure, though they continued to be reported from time to time, seem to have been ignored or forgotten, for in 1833 we find Prof. Joseph Pancoast⁴ giving a clinical lecture on a case of empyema in which he advised caution and conservatism in dealing with it surgically, and telling

¹ Misc. Acad. Nat. Curios, Lips. et Francof., 1694, 3 decuria. i. 216.

² Phil. Trans. of London, 1751-52, xlvii. 407.

³ Med. Communicat., Mass. Med. Soc., 1790-1808, Boston, 1808, i. 66.

⁴ AMERICAN JOURNAL OF THE MEDICAL SCIENCES, Phila., 1833, xiii. 93.

at the same time in the course of his lecture the following story: "A case of abscess of the chest of some interest occurred a few years ago in the upper part of this State (Pennsylvania) in the practice of a medical friend and was cured in a way somewhat *unique*, which would seem to make it worthy of recital. A man was seized with some affection within the thoracic cavity which resisted the prescriptive treatment of his physician. The stethoscope at that period had not come into general use and the case was so ambiguous that its character was not revealed by its symptoms. The patient and his friends entertained the opinion that he was laboring under pulmonary consumption. No swelling, no discoloration, existed externally upon the thorax; but the patient, from the internal sensation produced by the disease, had a settled conviction that there was a *gathering* within. Taking a seat by an unfrequented side of the house, he plunged the blade of his penknife opposite the seat of pain between the ribs. He was found with pus flowing from the wound; a large quantity was discharged from the narrow wound. From that time his symptoms were relieved and the patient finally recovered."

The adequacy of treatment by simple, direct, free incision could not get itself recognized, however; and it has not been sufficiently realized yet. The profession continued to flounder in confusion regarding the treatment of empyema, many continued to advocate what they believed to be a wise conservatism, and in 1876 Dr. Goodhart, of Guy's Hospital, wrote, "It has long been known that an empyema may often be safely let alone." With the development of antiseptic surgery, however, the pendulum of opinion and practice swung too far the other way and has not yet returned to rest.

In an able paper entitled "Rib Resection in Empyema, Indiscriminate and Excessive Practice Thereof," published in 1899, Dr. Edmund Andrews,¹ of Chicago, deplors the fact that some surgeons "go so far as to advocate the resection of ribs in all cases of empyema," and says: "They forget the splendid results we have had for twenty-five years in cases that do not need resection. When we learn some new thing in surgery we seem straightway to forget what we knew before." Dr. Andrews, while recognizing the sufficiency of simple intercostal incision without resection, still considered it desirable to have specially constructed flanged drainage tubes and recommended a double tube of the kind devised by Hancock. He advocated, too, a daily irrigation with boric acid solution and said: "In this treatment we soon learned that air in the pleural cavity had no septic influence, if the cavity itself was well wet with a mild antiseptic fluid. The germs were destroyed and the cavity remained sterile." The objections to such routine irrigation, generally unnecessary and useless and sometimes dangerous, have

¹ Journal of the American Medical Association, 1899, xxxii., 451.

been already set forth; and experience has shown that air-entrance, under a proper gauze dressing, is innocuous, independently of an irrigation which can have little or nothing to do with the cessation of the septic process in the pleura after free egress has been given to the pus. And the special drainage tube has no practical advantage over the ordinary rubber tube, always on hand, which can be fenestrated with the operator's own scissors in a few seconds and flanged with two large safety pins crossed through its outer end.

It has remained for the author of a work on the practice of medicine to state the truth as to the proper treatment of acute empyema without ambiguity and with a simplicity and conciseness not found in any surgical work which has come to the notice of the present writer. Osler¹ says: "When it has been determined by exploratory puncture that the fluid is purulent, aspiration should not be performed except as preliminary to operation or as a temporary measure.

. . . It is sad to think of the number of lives which are sacrificed annually by the failure to recognize that empyema should be treated as an ordinary abscess by free incision. The operation . . . is by no means serious. A majority of the cases get well, providing that free drainage is obtained, and it makes no difference practically what measures are followed so long as this indication is met. The good results in any method depend upon the thoroughness with which the cavity is drained." It is unfortunate that such a direct statement of surgical good sense is lacking in most of the surgical text-books, and that the simple truth which it embodies has to be forgotten from time to time, only to be re-discovered and repeated in an effort to impress it upon the general practitioner.

The following five cases of acute empyema were treated in the U. S. Naval Hospital at Newport between March, 1901, and October, 1902. They were all in boys between sixteen and seventeen and a half years of age. In four of them the empyema was an immediate sequel of lobar pneumonia. A rapid and complete recovery ensued in each of these cases. In the other case, Case II, the empyema was developed from a serofibrinous pleurisy. Recovery proceeded more slowly in this case, and the patient purchased his discharge from the service before it was complete.

These five cases were all in that decade of life in which croupous pneumonia has the lowest mortality. All except Case I were boys of robust physique. They may be considered, therefore, to constitute a rather favorable series. The five cases were consecutive, and they were the only ones occurring in the hospital during the two years of my service. None of our fatal cases during that two years had empyema. We had, during that time, about one hundred and ten cases of croupous pneumonia, nearly all in the second decade of life, with eight deaths; and the fact that empyema was never over-

¹ Practice of Medicine, New York, 1896.

looked in such a large series convinced me that its diagnosis is easy and that failure to recognize it ought practically never to occur.

Though these five consecutive cases were all treated in a hospital where every appliance was on hand or easily obtainable, and where professional assistance could be had if needed, they were handled with the help of one or two nurses, without professional assistance (except in one case), without general anaesthesia, and without any special appliance; that is to say, they were treated precisely as every medical man should be prepared to manage a case in his practice. Local anaesthesia was produced with a lump of ice dipped in coarse salt and held against the chest, or with a spray of ether from a hand atomizer, or with a spray of ethyl chloride if a tube of it was at hand. The patient was propped with pillows into a sitting posture. The only implements used were (1) a scalpel for incision, (2) a pair of blunt straight scissors for enlarging it, (3) two pairs of haemostatic forceps to hold it open for the flow of pus, to introduce and advance the drainage tube, and to catch bleeding vessels if they were encountered, (4) about twelve inches of three-eighths inch rubber drainage tubing fenestrated on alternate sides at intervals of an inch, and (5) four large safety pins at least two inches long. All these articles, the dressings, and the patient's skin were, of course, duly sterilized beforehand.

CASE I.—E. J. M., apprentice, aged seventeen years, enlisted at New Orleans. Admitted to hospital March 4, 1901. Croupous pneumonia, left lower lobe. A few days before admission had been surveyed for impediment in speech, mental weakness and poor physique. March 17th, signs of effusion in right pleura. Temperature declined irregularly and was normal March 18th, 19th and 20th. March 20th, exploration showed effusion to be serous. Effusion increased very rapidly and fever returned. March 24th, effusion reached clavicle and aspiration removed 1925 c.c. of creamy pus. March 25th, patient propped in sitting posture; under local spray of ether from hand atomizer, free incision in sixth interspace near posterior axillary line. Two fenestrated tubes six inches long inserted. About 1500 c.c. more of pus removed at operation. Temperature fell to normal. Good drainage maintained. Daily dressing. Pulmonary gymnastics with Ralston James water bottles begun March 31st. Liberal diet and tonics. By April 15th, daily discharge amounted to only two ounces. Tubes shortened little by little. One tube removed April 19th. Pus showed no tubercle bacilli; pneumococci and other cocci abundant. Discharge did not cease until May 12th. May 14th, last tube removed. Gymnastics continued. Fistula healed completely May 24th. Cure perfect. Discharged from service well fleshed and in excellent health except for the defects for which he had been surveyed previous to his illness.

CASE II.—T. DeW. T. E., apprentice, aged sixteen years, enlisted at Chicago. Admitted to hospital November 5, 1901.

Acute pleurisy, left side. Temperature 103.6°, pulse 120, respiration 36. Friction heard. Temperature declined; effusion appeared and by November 10th reached the clavicle. Aspirated 1250 c.c. of flocculent serum, very slightly purulent. Moderate fever continued. November 16th, aspirated 700 c.c. of dark thin pus, which deposited a sediment of pure thick pus amounting to one-fourth of its volume after twenty-four hours. November 21st, aspirated 950 c.c. thick creamy pus. November 22, patient being propped in sitting posture, a piece of ice dipped in salt being used for local anaesthesia, free incision in sixth interspace left side just anterior to latissimus dorsi. Two fenestrated tubes, seven and eight and a half inches long, inserted. Free discharge. Ralston James exercise begun November 23d. Tubes shortened constantly and removed December 3d. Wound appeared to be healing, but fever recurred, and fluid being evident it was reopened December 17th with discharge of about 500 c.c. of pus. Eight inch tube inserted. Pus discharge continued in varying quantity and pulmonary expansion progressed very slowly. On March 21st he was progressing satisfactorily, the discharge being very little and the patient steadily gaining flesh and strength, when, by his own desire, he was discharged from the service that he might complete his recovery at home.

CASE III.—B. F. D., apprentice, aged sixteen years and four months, enlisted at Port Royal, S. C. Admitted to hospital March 13, 1902. Croupous pneumonia, right lower lobe. Crisis March 22d. Temperature rose again and took on a septic course. Pleural effusion appeared. March 30th, exploratory aspiration found pus. March 31st, patient propped in sitting posture, ice and salt for local anaesthesia, free incision in sixth interspace in front of latissimus dorsi, large amount of pus evacuated. One tube. April 2d, developed a parotitis (epidemic on the station at the time). Parotid swelling nearly gone by April 6th. Ralston James exercise. Tube progressively shortened. Forced out by fully expanded lung on May 7th. Continued to do well, gaining one-half pound daily on full diet. July 10th, he had completely recovered his health and strength and was discharged to duty. On July 13th he came down with measles, which was epidemic at the time.

CASE IV.—H. W. S., apprentice, aged seventeen years and three months, enlisted at New York. Admitted to hospital May 5, 1902. Croupous pneumonia right lower lobe. Crisis May 17th. Temperature took on an irregular course thereafter. June 10th, empyema diagnosed but pus not struck by exploration in axilla. Aspiration through ninth interspace just under angle of scapula evacuated about 500 c.c. of pus. Later on the same day, free incision in this situation under ethyl chloride local anaesthesia, with patient in sitting posture. Rubber tube eight inches into chest. This was connected with long tube terminating in bucket of boric acid solution

colored with methyl blue on floor beside bed, with interruptions of glass tubing at two points, near wound and near bucket, to observe flow of pus, siphon drainage being thus established. No aspiration of the solution in the bucket occurred. An excellent and steady flow of pus was maintained and Ralston James exercise practised. The apparatus was removed on June 18th, and a short tube left in with simple dressing. Tube left out July 10th. July 16th, no discharge, no fever. July 25th, entirely healed, no dressing, gaining flesh rapidly. Discharged to duty August 9th; recovery complete.

CASE V.—R. H. B., apprentice, aged sixteen years and eight months, enlisted at Saginaw, Mich. Admitted to hospital August 24, 1902. Croupous pneumonia, left lower lobe. Crisis, September 1st, followed by irregular temperature. Pleural effusion developed. September 13th, aspiration sixth interspace in midaxillary line drew 100 c.c. of pus. Next day, September 14th, patient propped to sitting posture, local anesthesia with ethyl chloride, free incision same situation, about 350 c.c. pus withdrawn. Two tubes introduced. Ralston James exercise. Expanding lung pushed out the last of a shortened tube October 4th. Wound healed by October 15th. Recovery complete, and discharged to duty, October 27th.

TRAUMATIC INTRAPERITONEAL RUPTURE OF THE BLADDER:

WITH A REPORT OF TWO CASES AND AN ANALYSIS OF ONE HUNDRED AND TEN CASES TREATED BY LAPAROTOMY.

BY ASTLEY PASTON COOPER ASHHURST, M.D.,

SURGEON TO THE OUT-PATIENT DEPARTMENT OF THE EPISCOPAL HOSPITAL; ASSISTANT SURGEON TO THE ORTHOPEDIC HOSPITAL AND TO THE DISPENSARY OF THE GERMAN HOSPITAL, PHILADELPHIA.

HAVING had occasion recently to operate on a patient with an intraperitoneal rupture of the urinary bladder, an operation which is rather rare even in these days of hourly abdominal sections, I have thought it worth while to record the case, and to present a statistical study of all the similar operations, one hundred and ten in number, of which reports have been found.

Of the three patients with this lesion that I have myself observed, the first was operated on by my father at the Pennsylvania Hospital while I was still an undergraduate, and was reported by him to the Philadelphia Academy of Surgery in 1898; while the two others came under my notice at the Episcopal Hospital, and have not hitherto been published.

CASE I.—Otto N., German, aged fifty-one years (No. 2449, P. E. H., 1904) was brought to the Episcopal Hospital shortly after mid-

night on the morning of October 24, 1904. He was admitted to the service of Dr. Richard H. Harte, to whom I am indebted for the privilege of operating, and of reporting the case.

The patient had been drinking on Saturday evening, October 22d, and on his return home that night fell on the street and against the door-steps. He had passed his urine about 6 P.M., and thinks he fell about 9 P.M. He felt immediately sharp epigastric pain, and was helped into bed, where he slept off his intoxication. A physician who was called to see him the next (Sunday) morning, passed a catheter, but drew only a little blood, and the patient was not relieved of his desire to urinate, which he had been totally unable to do since the accident. Purgatives were administered, but failed to open the bowels; the patient vomited everything, and finally the vomitus became fecal in character. His belly swelled up, was intensely tender, and the patient suffered great pain. Toward midnight his physician sent a note to the hospital, requesting that the ambulance be sent for the patient, whose malady he had diagnosed as intussusception.

On admission to the hospital, I found the man's abdomen very much distended, and extremely tender throughout. Rigidity was not very pronounced, owing to the great distention. There was dulness in the hypogastrium and the flanks, and the level of this dulness changed with the position of the patient. He vomited from time to time bile and black fluid, not very fecal, yet not altogether characteristic of blood. Examination of the lungs detected a few rales in the bases posteriorly. The heart appeared normal. The pulse was 120 and peritonitic in type. The temperature was 97.8° F.

A rubber catheter was passed, but nothing ran. The bladder was then injected with almost one quart of hot boric acid solution. None of it returned, nor was any appreciable change made in the hypogastric dulness. On withdrawing the catheter, its eye was seen to be plugged with a blood clot. The catheter was, therefore, again passed, and five and one-half pints of bloody urinous fluid were withdrawn. The fluid continued to dribble out, and as no material change was produced in the level of the hypogastric dulness, even by the evacuation of this large quantity, it was concluded that the urine was slowly draining from the peritoneal cavity through a rent in the bladder. The urine was so very bloody, however, that I suspected active hemorrhage from some other source within the abdomen. An enema was effectual in moving the bowels, and the patient was prepared for operation.

Laparotomy was done at 2 A.M., thirty hours after the injury. An incision of about two inches in length was made in the left rectus muscle, in the hypogastric region, close to the linea alba. The abdominal fat was one inch in thickness, and there was also at least one inch of peritoneal fat. A very fatty omentum pre-

sented in the wound, and almost immediately bloody urinous fluid welled up. The incision was then extended down to the pubes, and subsequently upward, its total length reaching five inches. The pelvis was full of this fluid, and nothing could be seen; blood clots floated up from the flanks. The small intestines were seen to be intensely congested, so I sought in them for the seat of hemorrhage, and found the under surface of the mesentery greatly lacerated and bleeding freely. This appeared to be about three or four feet from the ileocaecal juncture—probably the coil of ileum which normally lies in the pelvis, and which, I presume, was crushed against the spinal column by the vulnerating force. The bleeding from the mesentery was readily controlled by the application of a few purse-string sutures, and I then found that the serous coat of the ileum, a few inches farther down, was split off the bowel transversely, from one mesenteric attachment to the other, in several places. A few Lembert sutures were, therefore, introduced to try to overcome the defect, but without much success, as the bowel was so greatly distended, and I was fearful of prolonging this, the introductory stage of the operation.

Having thus checked the hemorrhage, I mopped out the pelvis, and by lowering the head of the table, and packing off the intestines with gauze, was at last able to see the rent in the bladder, which was on its posterior wall, and seemed to start extraperitoneally between the rectum and bladder, on the patient's right, and to slant forward nearly anteroposteriorly almost to the median line, its whole intraperitoneal length being between three and four inches. The bladder was collapsed, and the rent seemed so large in proportion to the size of the bladder that it was only the mucous lining of the two flaps, forming the lateral walls of the bladder, that enabled me immediately to recognize the condition of affairs present. With great difficulty, on account of the thickness of the abdominal walls and the deep seat of the rent in the bladder, I succeeded in placing seven interrupted Lembert sutures of silk. I inserted the superior sutures first, making the first three of the type of mattress sutures, and using them as guys to pull the bladder up toward the abdominal wound. If the patient's condition had not been so precarious I should have made all seven sutures of the mattress type, but the last four sutures were so extremely difficult to place that I was thankful to be able to insert even the ordinary Lembert sutures. The patient had meanwhile become nearly pulseless, and was being given saline solution intravenously.

The peritoneal cavity was now thoroughly irrigated with hot saline solution; a glass drainage tube was placed to the pelvis, and the upper part of the abdominal wound was closed with "through-and-through" sutures of silkworm-gut. A permanent catheter was placed in the bladder, and the patient returned to bed. The duration of the operation was fifty minutes.

The patient's pulse improved, he rallied from the ether, and became clear in his head; some nearly clear urine was drained away by the catheter; the abdominal tube was evacuated at suitable intervals, but the patient died suddenly, with dyspnoea, at 7 A.M., four hours after the conclusion of the operation. Being a Coroner's case, no autopsy was permitted.

CASE II.—George M., aged thirty-six years (No. 1559 P. E. H., 1901), on the evening of July 15, 1901, fell six feet while at work, striking his hypogastrium on a stone. He had been drinking water and beer during the afternoon, but was not intoxicated, and had eaten neither his midday meal nor his supper. He had voided his urine about one hour before the accident. He was at once brought by the patrol wagon to the Episcopal Hospital, being admitted to the service of Dr. Harry C. Deaver, to whom I am indebted for permission to report the case. The patient suffered great abdominal pain, and desired to urinate, but was unable to do so. A little bloody urine was drawn by the catheter. A pint of boric acid solution injected into the bladder was all returned. Evidences of serious intra-abdominal injury being, however, unequivocal, exploratory laparotomy was done about two hours after the accident by Dr. Deaver. The abdomen was full of blood-tinged fluid, but no urinous odor was detected. The stomach and intestines were examined and found to be uninjured. The pelvis was then examined, and a rent three inches long was discovered in the fundus of the bladder. This was closed with a continuous Lembert suture; the peritoneal cavity was thoroughly irrigated with hot saline solution; a glass drainage tube was placed to the pelvis, and a permanent catheter introduced through the urethra. The patient did well after the operation. Thirty-nine ounces of nearly clear urine were drained off by the catheter during the first twenty-four hours; the peritonitis subsided, and the abdominal drain was discontinued at the end of a week. Cystitis developed on the sixth day, but yielded to treatment, and the patient was discharged cured on the thirty-second day after admission.

HISTORICAL. The Dutch surgeon, von Roonhuysen,* in the seventeenth century, was the first clearly to describe rupture of the bladder. Bonetus† in 1679 records the case of a patient treated by paracentesis abdominis, but with fatal result. Benjamin Bell‡ in 1788 first proposed, and Walter,§ of Pittsburg, in 1862 first successfully employed abdominal section.

With the advent of antiseptics, the treatment by laparotomy and suture of the rent was placed on a sure basis, and has been the

* *Medico-Chirurgical Observations*, Englished out of Dutch, London, 1676, p. 120.

† *Sepulchretum*, Geneva, 1679, Lib. III. Sec. xxiv. Obs. 12, p. 1231.

‡ *System of Surgery*, 2d ed., Edinburgh, 1788, vol. v. p. 305.

§ See list of cases.

accepted method of treatment ever since. The classical statistics of Bartels* in 1878 of ninety-eight cases treated without operation with a mortality of nearly 96 per cent. became more and more unfavorable when compared with a death rate after operation of 62.5 per cent. from 1880 to 1890; of 54.28 per cent. from 1890 to 1900; and of 27.91 per cent. during the last five years.

FREQUENCY. Although, as may be seen from the first table appended to this paper, from seven to eight cases of traumatic intraperitoneal rupture of the bladder are now being reported yearly, it is still a comparatively rare accident. Conley thirteen years ago stated that among 8000 surgical cases in Cook County Hospital, Chicago, from 1889 to 1893, only five were traumatic rupture of the bladder. At the Episcopal Hospital in this city there were treated, from January 1, 1900, to January 1, 1905, 8367 surgical ward-patients; among this number there were thirty-six instances of injury to the abdominal viscera (0.43 per cent. of the whole), while among these thirty-six patients only three suffered from intraperitoneal rupture of the bladder. That is to say, intraperitoneal rupture of the bladder formed 8.33 per cent. of all abdominal injuries, and was met with but once among every 2789 patients. Intraperitoneal rupture is a much more frequent injury, however, than is extraperitoneal rupture, this latter forming only about 10 to 20 per cent. of all cases of rupture of the bladder.

The records of one hundred and ten patients treated by laparotomy have been examined, the original reference having been consulted in every case in which it was accessible to me, and in other cases I have taken pains to indicate the medium of information.†

Out of the whole number of records examined, it appears that sixty-three patients recovered, and forty-seven died, a total mortality of 42.72 per cent.

CAUSES. The causes of rupture of the bladder may be classed as *predisposing* and *exciting*. Among the former the preponderating influence of *sex* is apparent from the fact that, of the one hundred and four patients, whose sex is mentioned, ninety-four, or over 90 per cent., were male, and only ten were female. Mere liability to injury is probably not the only explanation for this marked difference. It has been pointed out by various writers that women are more prone than men to allow their bladders to become overdistended, and some authors have thought that the greater size of the pelvis in women and the lateral, rather than the anteroposterior expansion of the bladder, in the female sex, rendered this organ less liable to rupture, even when distended. So that, even were

* Archiv f. klin. Chir., 1878, xxii., 519, 715.

† There are certain cases included in previous tables, the reports of which it has been impossible to find. These cases—notably Halstrom's patient, quoted from the Lancet of June 28, 1888, and Hitchcock's second patient, quoted from the Pittsburgh Medical Review, 1888, ii. 55—have therefore not been included in my analysis, no trace of such records having been found in the journals referred to.

women exposed to injury as often as men, it is not probable that their bladders would be ruptured with the same frequency. It has been suggested, moreover, that the short urethra of the female may serve as a sort of safety valve, allowing immediate expulsion of urine and collapse of the bladder when this viscus is subjected to sudden compression. It is curious to observe in this connection that in McLaren's first patient, a male, urine spurted from the penis as the cart wheel, which produced the intraperitoneal rupture, passed over the patient's abdomen. Although the death rate was over 72 per cent. among the female patients, and less than 36 per cent. among the male, this difference is more apparent than real. For of the eight deaths among the female patients, only four were in cases of uncomplicated rupture of the bladder, the other four fatalities being met in (1) a child of seven years, who had fallen from a bridge to a passing boat, sustaining a diastasis of the sacro-iliac joint; (2) in a woman of twenty-eight years, who had a fracture of the base of the skull as well as of the pelvis; (3) in a girl of three and a half years, who was injured by a crushing accident, and had also a rupture of the intestine; and (4) in an adult patient, who was violently and repeatedly kicked in the abdomen by her drunken husband, and then thrown out of the window. If, therefore, these exceptional cases were disregarded, the mortality for the two sexes would be less markedly divergent.

In regard to *age*, it is naturally found that young adults—those who are most exposed to trauma of various kinds—form by far the larger proportion. Fifty three patients, or 60 per cent. of the number whose age is recorded, were between twenty and forty years of age. The youngest was a girl of three and a half years, who died, and the oldest were two men of fifty-six years, both of whom recovered (Braun, Gangitano). The mortality rates for various ages may be seen in the appendix, Table IV.

Another predisposing cause of importance is the condition of *intoxication*. Over 72 per cent. of the patients, in whose records this point is mentioned, are reported as being more or less drunk at the time of the injury, and it is a sad fact that in not a few instances in which the patients themselves were sober, they sustained their injuries because of intoxication in someone else (Rose, Zeldowitch). Not only does drunkenness predispose to injury in this way, by making the individuals both quarrelsome and unsteady on their feet, but it increases the amount of urine excreted, and by dulling the sensibilities renders the persons so affected often unconscious that their bladders are overdistended, and may even deprive them, when drunkenness is a long-continued habit, of the power of completely evacuating their bladders. The result of this last state—*atony* of the bladder—is that, although the patient may have passed his urine within an hour or so of the accident, his bladder may still be quite sufficiently distended to predispose it to rupture when

subjected to sudden injury. Another serious aspect of intoxication in these patients is that they frequently remain unconscious of the gravity of their injury, as in the case of my own patient, and sleep off their drunken state only to awake the next morning with a peritonitis fully developed, which could almost certainly have been prevented by prompt operation.

It is worthy of note that among the patients who were intoxicated at the time of the accident, the mortality was over 43 per cent.; while among the sober it was less than 28 per cent.

Distention of the bladder, apart from drunkenness, is itself an important predisposing cause. Even sober patients, hurrying to a urinal in the dark, have bumped against a post and ruptured their bladders, which would not have been in a condition to be injured had the calls of nature been attended to at an earlier hour.

The exciting causes of this affection are conveniently described as *blows*, *falls*, and *crushes*, corresponding to the somewhat humorous classification of patients into the quarrelsome, the drunk, and the innocent, originally made by Bartels. I do not find, however, that the cases of injury sustained through falls comprise all the patients who were intoxicated, nor that all the crushes were in patients who were innocent of drink. In sixteen cases the character of the injury is not stated, but it is given as a blow in twenty-nine cases, as a fall in forty-five, and as a crush in twenty. Of patients injured by a blow, 82.35 per cent. were drunk, and the mortality among such cases was 55 per cent; of those injured by a fall, 73.53 per cent. were drunk, and the mortality for these patients was 35 per cent.; while of those patients injured by a crushing force, only 38.46 per cent. were drunk, and the mortality under such circumstances was no more than 26 per cent. These figures, thus combined, show at once the life-saving value of early operation, and the lethal influence of intoxication. In the severest class of injuries—crushes—in which there is frequently some bony injury, and some visible contusion of the soft parts, the patients are hurried in patrol wagon or ambulance to the nearest hospital, and appropriate treatment is instituted with the least possible delay, and in such cases the death rate is considerable lower than in either of the other classes, in which the vulnerating force is often so trivial, or the fall so slight, that the patient walks miles, perhaps, to his home, or even to a hospital, and is there treated by simple catheterization, or not at all, and so fails to secure adequate relief until peritonitis is so far advanced as to make recovery very unlikely.

I have not included in this series any patients in whom the bladder was the seat of what has been called spontaneous rupture. These cases belong, with those due to perforation from ulcers and tumors, in a class by themselves, and cannot justly be considered traumatic ruptures in the strict sense of the term.

CLINICAL PATHOLOGY. The mechanism by which the bladder is ruptured has always been a subject of interest. It can best be discussed after studying the lesions produced by the injury. Of ninety cases in which the *site* of the rent is mentioned, in seventy it is stated to have been in the "dome," "fundus," or upper posterior wall of the bladder; in eight cases it was on the lower portion of the posterior wall, toward the rectum; in nine cases it extended from the dome down to the rectum, and in only three cases was it so far removed from the median line of the body as to be classed as being on the "lateral" wall. Since the peritoneum does not extend far on to the lateral walls, and as these rents were all of them intraperitoneal, it is evident that the term "lateral wall" must be interpreted as meaning the lateral portions of the posterior wall. There were eleven cases in which the rent, besides being intraperitoneal, extended for a short distance on to the extraperitoneal surface of the bladder, most frequently into the space of Retzius, but in a few instances involving the base and neck of the bladder. In three cases there were two rents; one intraperitoneal rupture, and a second, distinct extraperitoneal rent. In no case was there more than one rent situated intraperitoneally.

The *direction* of the rent is also of interest in connection with the mechanism. This matter is noted in fifty-three instances, the rent being in the sagittal plane in twenty-five cases; being irregular or oblique, but still more or less anteroposterior in nineteen cases, and in only nine cases taking a transverse or coronal course.

The *size* of the rent is of interest mainly from the point of view of recovery. In eighty-seven cases the dimensions of the rent in the bladder are given, and they may be classed in the following manner: Five cases, less than half an inch, with no deaths; thirty-six cases, less than two inches, with a mortality of 41.6 per cent.; forty-one cases, less than four inches, with a mortality of 46.3 per cent.; and five cases, where the rent was over four inches in length, the mortality in these cases being 40 per cent.

As pointed out by Dambrin and Papin, who have devoted special attention to the mechanism of these injuries, that portion of the bladder in which ruptures are most frequently found is naturally the weakest part. At the fundus of the bladder the muscular fibres are nearly all more or less anteroposterior in direction, and diverge to become circular around the urachus or to ascend along it. The serous coat of the bladder is the least elastic, and therefore most disposed to split of all its tunics. In consequence of this fact, the peritoneal surface of the bladder gives way more readily, on the application of a compressing force, than does any part of its extraperitoneal surface. Moreover, the fundus of the bladder is practically unsupported by external agencies. Posteriorly and at the sides, the distended bladder is supported by the pelvis—the rectum and the pelvic muscles acting in some sort as buffers; while in the hypo-

gastric region, where the vulnerating force is usually applied, the force itself, and the abdominal muscles, support the bladder, leaving its summit, its naturally weakest part, the only portion practically unsupported. Accordingly, the ruptures take place most frequently in this region, and follow usually the natural anteroposterior course of the muscular fibres of the bladder wall; for the circular fibres are relatively feeble, and are torn transversely much more easily than the strong, longitudinal fibres would be.

When the bladder is only partially distended, and when the vulnerating force is applied from above downward and backward, it seems probable that the posterosuperior aspect of the bladder is well supported, and that the rupture is apt to occur on the extraperitoneal surface, near the obturator or ischiatic foramina, the two areas on the pelvic aspect of the bladder least well supported. The experiments of Berndt* lend support to this theory.

When the original force fractures the pelvis, the rent in the bladder is much more likely to be extraperitoneal than intraperitoneal. Fully three-quarters of cases of ruptured bladder, complicated by a fracture of the pelvis, have been found by various investigators to be extraperitoneal in character. And in the extraperitoneal cases the rent is usually produced by perforation of the bladder by a fragment of bone, or from separation of one of the pelvic joints tearing the bladder open; but in the cases in which an intraperitoneal rent accompanies fracture of the pelvis, it is nearly always evident that if the rupture had not been intraperitoneal, there would have been no rupture at all—in other words, that the bladder rent is produced not by the fracture of the pelvis, but independently of it, by the same original injury which produced the fracture. Among the one hundred and ten cases tabulated there were fourteen instances of fracture of the pelvis, with a mortality of 35.71 per cent.

In at least four instances the theory of "contre-coup," or "general concussion of the body," has been invoked to explain intraperitoneal ruptures of the bladder. In Cusack's† case the patient suffered a general concussion of the body, and there was no clear history of abdominal injury. Kerr's patient fell "all doubled up" on his left hip; Roll's patient fell on the buttocks; and Bayard Holmes' landed on his feet and left hand.

SYMPTOMS. The sensations of the patient are so frequently dulled by his intoxicated condition that much more value can always be placed upon a physical examination. Of all symptoms, abdominal pain is naturally the most frequent, and is nearly as often felt in the epigastric as in the suprapubic region. It is, of course, in no way distinctive of rupture of the bladder. But there are certain symptoms so characteristic that they at once suggest the nature of the injury. The most important of these is at once a symptom and a physical

* Berndt, *Archiv f. klin. Chir.*, 1899, lviii., 815.

† Dublin Hospital Repts., 1818, ii., 312.

sign, and has been graphically described by Rose under the name "*blutige Anurie*"—bloody anuria. The patient is eagerly desirous of passing urine, but is totally unable to do so; he may succeed in expelling a few drops of bloody fluid, but it is not to this that the term bloody anuria properly applies; it is to the anuria which is the usual outcome of catheterization. If a patient, after sustaining some abdominal injury, passes blood in his urine, the only natural inference is that his urinary tract is injured, and the question at once arises whether the urethra, the bladder, or the kidney is the seat of the lesion. The character of the injury will almost always exclude traumatism to the urethra, and the ability to pass urine usually determines that the bladder is not ruptured, and so fixes the kidney as the site of the injury. But this last is not always the case, and many a patient has had his chances of recovery from a rupture of the bladder much impaired, if not entirely lost, merely because the examiner has decided that voluntary urination necessarily excluded rupture of the bladder. Examination of the records of eighty-six patients, in whom the question of spontaneous urination is noted, shows that it was present in nine instances, or nearly 11 per cent., a proportion sufficiently large to make dependence on this symptom alone rather fallacious.

The inability of the patient to stand upright, and his persistent tendency to double up his thighs toward his abdomen, has been considered a symptom particularly characteristic of rupture of the bladder. It does not seem probable, however, that it would be more marked in these cases than in oncoming peritonitis from any other cause; but if the patient is seen immediately after the accident, he is more apt to present such symptoms than those of severe shock, which usually are predominant when the intestines are ruptured, allowing the sudden escape of gas into the peritoneal cavity.

There should be no cases in which diagnosis is delayed until the development of peritonitis, for by physical examination, properly conducted, the question of the existence of a rupture of the bladder can be settled to a certainty almost without exception. The introduction of a catheter in cases of suspected intraperitoneal rupture has been strenuously objected to by certain surgeons, who argue that this is the surest way to produce peritonitis; they assert that normal urine is comparatively harmless to the peritoneum, but that a catheter is sure to carry bacteria into the abdominal cavity, and that an exploratory laparotomy is the best method of making the diagnosis. With these gentlemen I am nowise in accord. It appears to me that their premises are ill-founded, and their conclusions accordingly false. Normal urine may possibly, in moderate quantities, be comparatively harmless to the peritoneum. The experiments of Vincent,* and of Strauss and Tuffier,† are of consider-

* *Vide* Hofmokl, *loc. cit.*, S. 1161.

† *Vide* Dambrin et Papin, *Ann. d. Malad. d. Org. Gén.-Urin.*, 1904, xxii., 641.

able interest in this connection, since they show how long-suffering the peritoneum at times may be. But it should not be forgotten that these experiments were conducted with aseptic urine, which is rarely present in the human being, and is very exceptional in the class of patients composing the usual subjects of intraperitoneal rupture of the bladder. In the average patient the urine is septic, in greater or less degree, and although we know (Ferraton) that the peritoneum can absorb aseptic urine, and that up to the development of peritonitis, urine which is not aseptic may be thus disposed of, yet to make these facts an argument against the use of the catheter in diagnosing rupture of the bladder, appears to me unsurgical in the extreme. With proper care no further contamination of the peritoneum need be feared, and the information gained by catheterization and the accompanying tests, which will be presently discussed, will enable the surgeon to avoid needless laparotomies in an immense number of patients, who would be opened "exploratively" in vain, were the use of the catheter neglected.

It seems to me, then, that in suspected cases of rupture of the bladder, a catheter should be immediately passed, but it should, of course, be done with all aseptic precautions. I think a metal catheter is preferable in skilled hands to a rubber instrument. An intelligent surgeon will make a metal instrument act as an exceedingly long finger, in exploring the urethra and bladder, which cannot be done with a flexible catheter. And while I, of course, condemn jabbing the extremity of the catheter about in the bladder with the intent of thus discovering the rent, there can, I think, be no question as to the advisability of gently turning its point hither and thither, and noting the increase or decrease of the urinary flow as these manoeuvres are practised. In at least seven of the recorded cases, the rent was found in this manner. The risk of converting a partial into a complete rent by this method, is much less than that of leaving unsutured a rent involving one or two coats of the bladder only.

If this "catheter test" is not employed, or if it is negative, there remains the test known by Weir's* name, which is scarcely less valuable. This consists in first evacuating all urine possible, then injecting a measured quantity of fluid, and finally in seeking to recover all that was injected. As a rule, when the catheter is first passed, little or no urine is obtained. Of seventy-one cases in which the point is mentioned, absolutely no urine was obtained in three; a very small amount of bloody urine was obtained in sixty-one, and in seven cases clear urine was obtained. This shows the overwhelming importance of Rose's symptom of bloody anuria, but it also demonstrates the fact that when so important a symptom is contradicted by the presence of clear urine in one-tenth of the cases, dependence on symptoms alone will lead the surgeon astray.

* N. Y. Med. Record, 1887, i., 88.

Hence the value of Weir's test, of injecting the bladder after evacuation has been accomplished. Usually, it is recommended that only ten ounces or a pint be injected. This quantity has, however, on numerous occasions proved insufficient. In Deaver's patient, reported in this paper, one pint was injected, and it was all recovered, and this fact was taken to indicate that the bladder was intact. As a consequence, the bladder was not examined until the other organs, which might have been injured, had been found unhurt. It is safer, therefore, to continue injecting fluid with all gentleness, until a quart has been introduced, unless the development of a hypogastric swelling, characteristic of the unruptured bladder, sooner occurs and by its presence excludes the possibility of a solution of continuity of the bladder walls. Weir's test is recorded as having been employed in only sixteen of the reported cases. Undoubtedly it has been employed in many more, but the reporters have not included it in their record. Of these sixteen cases, it was positive in twelve, and negative in four. In the negative instances the rent in the bladder was only about a half inch in length in two cases (Bolton, Hofmokl); in the third (Deaver) only a pint of fluid was used; but in the fourth (Alexander) the rent was four inches in length, and there is no apparent reason why the test should have proved negative. In Walsham's second patient the test was doubtful, and he accordingly injected air into the bladder. This test was positive to an alarming degree; the abdomen at once became tympanitic; the liver dulness, present before, was suddenly obliterated, and the patient went into a "condition closely resembling collapse." In my own patient the injection test may be said to have been doubtful in a certain sense, although no fluid was recovered at the first attempt, since, after freeing the catheter eye of a clot, a larger amount than was injected was finally evacuated. Yet the very fact that more fluid was recovered than was injected was very good evidence that the superfluous quantity came from the peritoneal cavity and not from the bladder.

The cystoscope is naturally nearly valueless in these injuries, since the bladder cannot be satisfactorily distended. Yet Roll made his diagnosis by its means on the fourth day, and had the satisfaction, some weeks later, of viewing by the same means the scar left in the bladder by his successful suturing of the rent. At the operation the rent in the bladder was found feebly stopped by a prolapsing coil of intestine.

The force with which the stream flows from the catheter, and the intermittent exacerbations of force, due to the compressing action of respiration on the abdominal contents, are signs which have been dwelt upon by some authors as particularly significant of fluid draining from the general peritoneal cavity. For my own part, I should attach little value to these characteristics, as I have seen the same features repeatedly when drawing urine from atonic

bladders, in which there was no other expulsive force than that of the abdominal muscles and the diaphragm.

Palpation is of little value, except for the detection of the usual signs of peritonitis. Percussion is much more reliable, and will usually detect not only the distended bladder, if present, but on the application of Weir's test will demonstrate the development of a hypogastric tumor with the characteristics of the bladder if this viscus be still unruptured. The discovery of free fluid within the abdominal cavity, the dulness in each flank disappearing as the patient is rolled to the opposite side, furnishes what is probably as certain proof of the nature of the injury as can be obtained by the ordinary methods of physical examination. The patient might of course be the subject of ascites, or the fluid might be intestinal contents or blood, but as a rule these affections can be ruled out by other symptoms. If the fluid were intestinal contents the shock immediately following the accident would probably have been greater, and the onset of peritonitis would have been correspondingly rapid; while the evidence of internal hemorrhage would in the latter case have probably overshadowed all other symptoms. The absence of movable dulness in the flanks must not, however, be taken to indicate that no urine has escaped from the bladder into the peritoneal cavity. As already remarked, the peritoneum is quite able to absorb a certain amount of urine, and during the first twelve or twenty-four hours may absorb it, if fairly normal in quantity, nearly as rapidly as it is excreted by the kidneys, and hence the urine may not begin to accumulate in the dependent portions of the abdomen until the development of reactive exudation from the peritoneum impairs its absorptive power. This was probably the case in Blumer's patient.

DIAGNOSIS. When the history is clear, and other injuries do not distract the attention of the examiner, the presence of a ruptured bladder need scarcely ever be overlooked. Given a man, drunk, or drinking, who has sustained some abdominal injury, the first organ to be excluded from the category is the bladder. If it be possible to determine that the bladder was full when the accident occurred our suspicions will naturally be re-doubled. The patient may have felt something give way inside him when he was injured. Desire to urinate with inability to do so, usually follows as soon as the first shock of impact and the sudden pain in the belly allows the patient to consider his natural feelings. Passage of a catheter then draws no urine, or, at most, a little bloody fluid. With a clear history these facts alone would warrant a surgeon in resorting at once to laparotomy, and it seems incredible that patient after patient has been catheterized and re-catheterized without drawing urine; has been purged and given all manner of drugs by physicians who are supposed to be able to make a diagnosis of intra-abdominal affections, and that the patient has only as a last resort

been sent to a hospital, or placed under a surgeon's care, with the ready-made diagnosis of intussusception, extrauterine pregnancy, strangulated hernia, or even merely peritonitis!

TREATMENT. There is no question that the proper treatment is to open the belly, suture the rent, evacuate the urinous fluid, and drain the wound until there is nothing left to drain. With this treatment promptly instituted three out of four patients are being saved at the present time. This increase in the rate of recovery, well shown in Table II, can only be maintained or improved by operating as soon after the injury is received as possible. For practically all operations done within a few hours have been within the last five years. Taking all the recorded cases of operation, it is seen that of those patients operated upon within eight hours, and within twelve hours after the accident, the mortality is practically the same—from 33 to 37 per cent. (Table VII). After twelve hours have elapsed the mortality jumps at once to over 50 per cent. The number of patients operated on over thirty-six hours after the injury is fortunately small, and hence does not allow of any very definite conclusions, but merely shows that the few individuals who have enough vital resistance to live that long, without any operation, have more than the surgeon has a right to expect of his patients. The notorious patient of Ledderhose, who survived the immediate results of the injury, and recovered after the opening, on the seventeenth day, of an intraperitoneal abscess in communication with the bladder, got well, as Zeldowitch sententiously remarks, more by good luck than good management.

The incision in the hypogastric region should be amply large to facilitate rapid operating. A number of surgeons advise first opening the space of Retzius, exploring for extraperitoneal rupture, and then opening the bladder, as in suprapubic cystotomy, and examining the interior of this organ for the evidence of a rent. I do not, myself, see that this course presents any advantages, unless in some exceptional case, in which the diagnosis between extraperitoneal and intraperitoneal rupture had not been made before the operation. On the other hand, such a course presents to my mind many obvious disadvantages. It is primarily a pure waste of time. If the rupture is intraperitoneal, it is perfectly needless to view it from within the bladder, whence it could not be satisfactorily sutured; and by opening the bladder through the space of Retzius we will only be adding a second wound to the one already existing. Even if an intraperitoneal rupture be not accessible when the intraperitoneal surface of the bladder is exposed, the surgeon is at least enabled to evacuate the abdominal fluid, and to take measures for excluding the bladder area from the rest of the peritoneal cavity—matters of much importance, but impossible of accomplishment from within the bladder.

If no other injuries demand immediate attention, the surgeon's

first act should be to find the rent in the bladder and suture it. There is no use in cleansing the peritoneal cavity until further soiling of it has been prevented. Degen made the attempt to wipe the abdomen dry before suturing, but abandoned the task, because, as he says, he found it a "Sisyphus Arbeit." Yet it is often necessary to mop a certain amount of fluid out of the pelvis before the bladder can be inspected. For this purpose no method is so convenient and rapid as the use of large marine sponges, which will absorb fluid in much greater quantities than will gauze. The Trendelenburg position facilitates the discovery and suture of the rent, but the use of Peterson's rectal bag (advocated by Weir) is usually needless, and may be harmful. The intestines must be protected and kept out of the way, during the suturing, by means of gauze packs.

The suture material is preferably of silk. It has usually been found quite sufficient to apply a single row of seroserous sutures, reinforcing the first row at one or two points as needed. If the wound is deep, it is best to insert the anterior sutures first, and then to use them as guys in pulling the bladder upward. A long needle holder is a convenience. Care should be taken to approximate closely the posterior extremity of the rent, which is the point most apt to leak. If two layers of sutures cannot be inserted it is best to make the single row interrupted, and of the mattress type, when possible. Such stitches are less apt to tear out, and bring the serous surfaces together more accurately.

Some surgeons have not sutured the rent at all. In eighty-nine instances it was sutured, with a mortality of 38.2 per cent.; and in six cases it was not sutured, with a death rate of 50 per cent. The difference is not so marked as one would expect. In four patients, the rent, though undoubtedly intraperitoneal, could not be found. The mortality in these cases was 50 per cent.

A method of exclusion of the rupture has been advocated by Hellendahl,* and practised by B. Holmes, Förderl, Hildebrand, and Madelung. This plan consists in suturing the edges of the rent in the bladder to the parietal peritoneum of the anterior abdominal wall, thus converting the rupture into an extraperitoneal injury. Drainage of the bladder is then provided through the rupture, which is left open for the purpose, and the peritoneal cavity is separately drained, when necessary, through the upper half of the abdominal wound. This method is not readily applicable to any cases except where the rent is in the dome of the bladder, but B. Holmes and Förderl closed the posterior half of the rupture by sutures, and then stitched the edges of its anterior portion to the parietal peritoneum; while Madelung, in whose patient the serous coat of the bladder was relaxed, as the result of urinary infiltration beneath it, first closed the entire rent with sutures, then laid a strip of iodoform

* Inaug. Dissert., Strasburg, 1896.

gauze over it, and finally sutured the visceral peritoneum covering the bladder to the parietal peritoneum of the anterior abdominal wall, so that the iodoform gauze somewhat resembled the tube employed in Witzel's method of gastrostomy. Both Hildebrand and Madelung had first opened the bladder through the space of Retzius, and therefore used that wound for drainage.

It seems to me that this rather complicated method possesses no advantages whatever over complete closure of the intraperitoneal rent in the usual way, except it were in a patient with impermeable stricture of the urethra, in whom no other outlet for the urine existed. Lyot employed a somewhat similar procedure in such a patient, with perfect success. Extraperitoneal wounds of the bladder into the space of Retzius should always be left unsutured, at least in part, since firm adhesion of muscular tissues does not occur promptly enough to prevent leakage of urine from the bladder, and the establishment of at least a temporary urinary fistula. Intraperitoneal wounds, on the contrary, heal with sufficient firmness in so short a time as to justify one in not anticipating leakage. Of the four patients treated by Hellendahl's method, B. Holmes' was the only one that died.

When the intraperitoneal rent can be securely closed, there is, therefore, no need to drain the bladder suprapubically. Injection of the bladder to test the security of the sutures is not advisable.

As soon as the tear in the bladder has been disposed of, the surgeon must devote his attention to the removal of the urine from the general peritoneal cavity. I have already expressed my opinion as to allowing this fluid to remain indefinitely, with the idea that the peritoneum will absorb it. One success, such as in Schramm's patient, by no means justifies us in such a course. As the urine is usually widely dispersed in the abdomen, filling the flanks as well as the pelvis, it can be most quickly evacuated by irrigation, which should be prolonged until the fluid returns clear, and is free from urinous odor. Mopping several quarts of fluid out of the abdomen is a tedious matter, as anyone may know who tries it (experiments are best made on the cadaver), and the repeated insertion and withdrawal of gauze sponges cannot fail seriously to abrade the serous lining of the abdomen. I say this in spite of the fact that my investigations show that among forty patients, treated by irrigation, the mortality was 40 per cent., while among twenty-five, treated merely by wiping, the mortality was only 28 per cent. The difference, as further analysis of the cases shows, consists in the fact that when wiping alone was employed the urine was mostly confined to the pelvis; whereas, in a majority of the patients irrigated, urine, blood clots, and even pus, were present in the kidney pouches, and in some instances around the stomach and liver, as well as in the pelvis.

It is safer to drain the peritoneal cavity by a tube reaching to the

rectovesical pouch. By placing the patient in the semi-sitting posture, the retained fluids or any exudation from the peritoneum will thus gravitate to the pelvis, and may be withdrawn through the tube at suitable intervals. It is noted in the case records that fifty-three patients were treated by drainage of the peritoneum, with a resulting mortality of 32 per cent.; while among thirty-nine patients, whose peritoneal cavities were closed without drainage, the mortality was nearly 36 per cent. The difference according to figures is, therefore, of little moment, but it is to be explained, as in the instance cited above, by the fact that the more severe the peritoneal infection, the more apt a surgeon is to drain; that is to say, by means of carefully instituted drainage the mortality of the severe cases has been rendered about the same, in the aggregate, as that of the mild cases. In any case when the integrity of the suture line is doubtful, it is well to protect the intestines from the bladder and the drainage tube by a strip of gauze.

It is also, I think, worthy of notice that among nineteen patients whose bladders were drained suprapubically, either by means of Hellendahl's method, or through a suprapubic cystotomy incision, there were only three deaths—a mortality of 15.78 per cent. These figures, together with the fact that of the twelve patients who developed suprapubic urinary fistula after the operation *not one* died, seem to show beyond doubt that free and constant drainage of the bladder is imperative. As I have remarked before, an intraperitoneal rent can usually be so securely sutured that leakage need not be feared, and the bladder can then be drained by an inlying catheter introduced through the urethra. If the intraperitoneal rent, therefore, cannot be securely sutured, or if there be an extra-peritoneal opening, it would seem wisest to provide for suprapubic drainage of the bladder, which has been demonstrated on many occasions to be much more free and complete than perineal drainage or that obtained by an inlying catheter.

If an inlying catheter cannot be tolerated by the patient, he should be catheterized every three or four hours during the first few days; and if even this course produces undesirable pain or inflammation, a urinal should be taken to him every two hours and he should be made to urinate day and night with unfailing regularity, but less often, after the first day or two, until recovery is assured.

STATISTICAL SUMMARY.

TABLE I.

Recovered	63
Died	47
Total	110
Mortality, 42.72 per cent.	

TABLE II.

Date.	Operations.	R.	D.	Mortality per cent.
1860-69	1	1	0	00.00
1870-79	2	0	2	100.00
1880-89	24	9	15	62.50
1890-99	35	16	19	54.28
1900-1905	48	37	11	22.91
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1860-1905	110	63	47	42.72

TABLE III.

Sex.	R.	D.	Total.	Mortality per cent.
Male	60	33	93	35.48
Female	3	8	11	72.72

(In 6 cases the sex is not recorded).

TABLE IV.

Age.	R.	D.	Total.	Mortality
Less than 5 years. . . .	2	1	3	33.33
5 to 10 "	2	1	3	33.33
10 to 20 "	3	0	3	00.00
20 to 30 "	17	7	24	29.16
30 to 40 "	17	12	29	41.37
40 to 50 "	14	7	21	33.33
50 to 60 "	3	3	6	50.00

Age.	Cases.	Deaths.	Mortality per cent.
Less than 20 years. . . .	9	2	22.22
20 to 40 "	53	19	35.84
40 to 60 "	27	10	37.00

(In 21 cases the age is not recorded)

TABLE V.

Character of injury.	R.	D.	Total.	Mortality per cent.
Blow	13	16	29	55.17
Fall	29	16	45	35.55
.	14	6	20	26.31

(In 16 cases the character of the injury is not stated)

TABLE VI.

	R.	D.	Total.	Mortality per cent.
Intoxicated	31	24	55	43.64
Sober.	16	6	22	27.27

(In 33 cases sobriety or drunkenness not mentioned)

TABLE VII.

Time between injury and operation.	R.	D.	Total.	Mortality per cent.
Less than 8 hours	10	6	16	37.49
Less than 12 "	10	5	15	33.33
Less than 24 "	16	17	33	51.50
Less than 36 "	3	3	6	50.00
Less than 48 "	7	2	9	22.00
Third day or later	13	6	19	31.57

(In 12 cases the time between injury and operation is not given)

TABLE VIII.

Size of rent in bladder.	R.	D.	Total.	Mortality per cent.
One-half inch or under . . .	5	0	5	00.00
Two inches or under . . .	21	15	36	41.66
Four inches or under . . .	22	19	41	46.34
Over four inches.	3	2	5	40.00

(In 23 cases the size of the rent in bladder is not given)

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- N. B.—Since going to press Marnoch (*Annals of Surgery*, 1906, i. 241) has recorded a successful laparotomy for intraperitoneal rupture of the bladder.

EXPERIMENTS ON THE GREAT OMENTUM.

BY LEONARD S. DUDGEON, M.R.C.P. (LOND.),

BACTERIOLOGIST TO ST. THOMAS' HOSPITAL AND JOINT LECTURER ON GENERAL PATHOLOGY IN THE MEDICAL SCHOOL; DIRECTOR OF THE CLINICAL AND PATHOLOGICAL LABORATORY,

AND

ATHOLE ROSS, M.B. (CANTAB.),

LATE HOUSE PHYSICIAN TO ST. THOMAS' HOSPITAL, LONDON.

(From the Pathological Department of St. Thomas' Hospital, London.)

THE GREAT OMENTUM. It is an undoubted fact that the great omentum plays a very important part in the bacteriology of peritonitis, but of still more importance is its relation to cellular pathology.

To Herbert Durham¹ is due the credit of first drawing attention to these facts. It is surprising, therefore, that so little notice should have been paid to the functions of this portion of the peritoneum when we consider the importance of Dr. Durham's valuable paper.

BACTERIOLOGY OF THE GREAT OMENTUM. The important part which the omentum plays in peritonitis, if we can judge from surgical text-books, has almost escaped notice.

Klein has remarked that the omentum is intensely injected in guinea-pigs dead from peritonitis, and may sometimes show petechial hemorrhages. This condition, as Durham has already noticed, is a constant feature of peritonitis in both man and animals. In guinea-pigs dead from peritonitis we always find the omentum rolled up toward the diaphragm; this feature of the great omentum may often be observed a few hours after an intraperitoneal injection of a pathogenic organism. The cause of this rolling up is due, as Durham has stated, to the peristaltic movements of the intestines.

The term "chemical peritonitis" introduced by Tavel and Lanz, has now been shown to be incorrect, owing to the researches recently made by Dudgeon and Sargent² on the bacteriology of peritonitis.

¹ The Mechanism of Reaction to Peritoneal Infection, *Journ. Path. and Bact.*, 1896 and 1897, vol. iv.

² The Bacteriology of Peritonitis. Constable, London, 1905.

These observers have shown that the so-called chemical peritonitis is really a peritonitis due to the staphylococcus albus. They have also found that the staphylococcus albus and other micro-organisms may be found on the surface of the omentum, although the peritoneal exudate may have been sterile.

The importance of these facts is overwhelming. It proves beyond question that the omentum should be examined in every case of peritonitis, and in every animal experiment, and that the examination of the peritoneal exudate alone may be of little value. Durham questioned the accuracy of the term "chemical peritonitis" in his classical monograph on peritoneal infection to which we have already referred. He states: "Pieces of omentum will sometimes show both microscopically and in culture that microbes are present, whilst the fluid of the peritoneum is sterile. These remarks apply to the peritonitis of man and that produced experimentally in animals." In conclusion, Durham adds: "These facts make one chary of accepting the 'chemical (aseptic)' peritonitis of Tavel and Lanz as well authenticated, in the absence of more thorough evidence."

Our own investigations on the bacteriology of the great omentum in both man and animals are of interest, and are referred to elsewhere in this communication; but suffice it to state here that (1) the normal omentum is not always found to be sterile, since in large numbers of instances the white staphylococcus can be cultivated when pieces of this tissue are dropped into broth; (2) the peritoneal exudate will be found to be sterile after the injection of sterile chalk or sterile normal saline into the peritoneal cavity of animals, while the white coccus can be obtained from the omentum in many instances in the same animals whose peritoneal exudate has been found to be sterile.¹

In conclusion, it will be convenient here to again draw attention to one of our experiments in which we had injected the bacillus aerogenes capsulatus into the peritoneal cavity of a guinea-pig.

The animal was killed at the end of twenty-four hours from the time of inoculation and film preparations were made from the peritoneal exudate and from the great omentum.

A differential count of 500 cells present in the peritoneal exudate showed 451, or 90.2 per cent., of finely granular polymuclear cells, *but none contained micro-organisms*, while from the great omentum 489, or 99.6 per cent., were present, and *every cell was phagocytic*. This experiment and many others confirms if it were necessary, the value of the examination of the great omentum in every case of peritonitis, as Durham originally pointed out.

CYTOLOGY. The intensely active phagocytes described by Metschnikoff² as the macrophages are derived from the endothelial

¹ Phagocytosis, Trans. Path. Soc., London, 1906, and Lancet, October 21, 1905.

² La Theorie des Alexocytes, Ann. de l'Institut Pasteur, 1893, vii.

cells of the great omentum and also from other situations. During the macrophage stage, Durham has observed the large cells of the omentum to be amœboid. Foci of multinuclear and binuclear cells occur, from which cells having all the appearances of the free macrophages are budded off. The large hyaline cell met with in the blood is also of this class, and many other mononuclear cells. These cells Metschnikoff and others have shown to play an important part in peritonitis after the first sixteen hours. Durham has found large numbers of these cells in the great omentum englobing micro-organisms and also microphages. Numerous observers have stated that from five to six minutes up to and including one hour after an intraperitoneal injection the peritoneal fluid becomes almost cell free. This leukopenic stage has generally been considered by Metschnikoff and others to be due to the fact that the cells are dissolved. Durham has shown, however, that the cells which, as we know, have a strong tendency to clump are gathered together on the great omentum. The only cells which are found during this period in the peritoneal exudate, according to these authorities, are the small lymphocytes which, as Durham has shown, do not form part of the clumps present in the peritoneal fluid during this stage, and, therefore, are much less readily attracted toward the great omentum.

Our results differ in many points very considerably from the observations of most of the previous workers on this subject. We have found that the mononuclear cells are generally most numerous in the peritoneal exudate at the end of the first quarter of an hour after inoculation, but we have also noted that the fluid in the peritoneum is often abundant and the cells likewise, while in many instances cells other than the small mononuclears are plentiful in the exudate at this period.

In some cases, however, the coarsely granular eosinophile was found to be the chief cell, in other instances the large mononuclear. In every instance, the clumping of the cells was obvious at this period, the clumps were both small and large, but generally small, while the lymphocytes were usually free, as Durham has shown. In one instance, the peritoneal exudate of an animal was examined half an hour after inoculation, in which case the endothelial cell formed no less than 86.2 per cent., and 145 out of 500 were found to be phagocytic. It is, of course, impossible to derive any exact observations from the results of a solitary experiment. If, however, we refer to the one-hour cases, we shall find that in most instances the finely granular polynuclear cell formed the chief variety of leukocyte at this stage. Durham considers that the leukopenic period actually terminates with the appearance of these cells. He adds, however, that for some time after the arrival of the microcyte the fluid remains leukopenic. With

this remark we cannot agree, as will be shown by referring to the tables which are given below.

PERITONEAL EXUDATE EXAMINED AT THE END OF FIFTEEN MINUTES.

No. of observations.	Amount of peritoneal fluid.	Nature and number of cells.
14 . . .	Large . . . 9 cases . . .	Cells abundant in 9 instances; in small number in 5 cases. The small mononuclear cells amounted to over 90 per cent. in 8 examples. In the remaining instances, in four examples the coarsely granular eosinophiles formed the large majority of the cells, and in two cases the endothelial cell was the most common variety. In both of the last-mentioned instances the peritoneal exudate was obtained from rabbits.
	Fair . . . 2 cases . . .	
	Small . . . 2 cases	
	None in one case	

PERITONEAL EXUDATE EXAMINED AT THE END OF ONE HOUR.

11	In 8 cases the cells were numerous, in the remaining instances scarce. In 9 examples the finely granular polynuclear cells amounted to over 50 per cent., in one case to 97.2 per cent. In the remaining 5 instances, they were either equal to or less than one of the other varieties of leukocytes.
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EXPERIMENTS ON THE OMENTUM. In connection with their work on the bacteriology of peritonitis, Dudgeon and Sargent have noted the fact that in every class of case the staphylococcus albus is the first organism to appear in the peritoneal cavity, and that organisms are frequently found on the surface of the gut but not always in the exudate.

We were thus induced to undertake the following short series of experiments in the hope that they might lead to additional information as to the part played by the omentum in peritoneal phagocytosis.

Every precaution was taken in procuring the specimens of omentum to avoid contamination from all possible sources.

The first series of six guinea-pigs were all examples of healthy animals. In three instances an abundant growth of the white coccus was obtained from the omentum, in one a slighter but quite definite growth, while the remaining two cases proved to be sterile. In every animal of this series the peritoneal exudate was sterile.

The second group of animals all received an intraperitoneal injection of a sterile solution of normal saline, with the result that the staphylococcus albus was grown from the omentum in all three cases (after two, four, and eight hours) and again in every instance the peritoneal fluid was sterile.

The final series of guinea-pigs were similarly inoculated with sterilized chalk in normal saline. Here the white coccus was grown from the omentum not only after two, four, and eight hours, but also at the end of twenty-four hours (in three examples

out of four). In every instance the peritoneal exudate proved to be sterile, thus giving in this respect a uniform result throughout this research.

It is hardly necessary to add that the materials used for inoculation were proved sterile by cultural tests.

The conclusions warranted by these experiments appear to be:

(a) The staphylococcus albus is often present as a normal inhabitant of the omentum.

(b) When non-bacteriological substances are injected into the peritoneal cavity of animals the staphylococcus albus can usually be recovered from the great omentum.

One of us has cultivated the same white coccus from the omentum in many cases in which the peritoneum was opened, apart from peritonitis. In all these cases the pieces of omentum were dropped into culture tubes of broth and the growth investigated in the usual way.

SAUERBRUCH'S OPERATIVE CHAMBER: HISTORY, EXPERIMENTS, AND EXPERIENCES.¹

BY BERNHARD HAHN, M.D.,

OF TACOMA, WASHINGTON,

LATE ASSISTANT TO PROF. V. MIKULICZ, OF Breslau, GERMANY.

THIS paper may serve as a slight tribute to the genius of the late Professor v. Mikulicz, a man who was more popular in this country than any other foreign surgeon and who, perhaps, felt more sympathy for America than any other ever did. The invention in which I wish to awaken your interest is the last of those great boons to humanity which came from the Mikulicz clinic and which have made that clinic famous far beyond the German frontier.

The close relations I maintain with Sauerbruch, my thorough acquaintance with the history and development of his invention, which I followed as an eye witness, and finally the fact that I assisted Professor v. Mikulicz in his operations on men in the chamber, may explain why I feel qualified to write on this subject.

The method is one of performing operations within the thoracic cavity. As I had the good fortune to witness the progress of the work from beginning to end, and had some personal part in it, too, I will endeavor to give an historical picture, without entering into details or scientific argument.

In October, 1903, I was present when my late chief, Professor v. Mikulicz, of Breslau, gave to one of the youngest externes of his

¹ Read before the County Medical Society at Tacoma, Washington, October, 1905.

clinic this suggestion, to find a way of avoiding pneumothorax, during intrathoracic operations—a problem which naturally was very dear to a surgeon like v. Mikulicz, who had done so much for the development of abdominal surgery and whose ambition naturally strove to overcome the obstacle, which until now had prevented a similar development of thoracic surgery. Perhaps Sauerbruch was especially well fitted for this work as his former scientific training gave him a knowledge of physical laws. In fact, we his colleagues, soon learned of the beginning and progress of his labor and after the first surprising successes in experiments on animals, this subject formed the topic of our daily conversation.

I do not need to mention here that the respiratory work of the lung is done by two functions: namely, the active work of the thoracic muscles and the natural elasticity of the lung parenchyma. The equilibrium of these two functions is guaranteed only so long as the pleural cavity remains closed and air-tight. The moment this is no longer the case, the elasticity of the lung will preponderate, the lung will collapse and we have a pneumothorax with all its dangerous sequelae. A simple consideration must tell us that a pneumothorax would be preventable if it were possible either to produce within the lung an increase of pressure, or to decrease the atmospheric pressure upon the lung from without. Sauerbruch chose the second method. After some other experiments which were quickly abandoned, he came to the idea of inclosing the field of operation; that is to say, the thorax, in a kind of box which represents a vacuum, or more correctly, that contains rarefied air, so as to produce an increase of air pressure from within, which prevents the lung from collapsing after the opening of the pleural cavity. It was evident that operating under such conditions would be most difficult and it was but a step to the idea of placing the whole animal, with the exception of the head, into an experimental cabinet in which there was a pressure lower than the atmospheric. A simple idea, a veritable egg of Columbus, only no one had until then thought of setting it upon its point.

The cabinet first constructed was a cube with wooden walls which were lined with tin and which was as air-tight as possible. This furnished a space of two cubic metres, which was just sufficient to hold an operating table and two men. In one wall there was a round opening which was closed off by means of a rubber septum perforated in the middle. On the opposite wall was a door through which one could enter or leave the room. A cylinder was fitted into the third wall, standing in communication with an electromotor, by means of which the air was pumped out of the room. It was at all times possible to note the rarefaction of air by means of a mercury manometer and to control it by a valve.

The animal used for the experiment (dogs being used almost exclusively) was placed on the table, its head forced through the

above mentioned opening in the rubber septum and was thus placed outside of the cavity, so that it breathed under natural atmospheric pressure. The narcosis was given under the same condition.

It was indeed a spectacle for me, which I cannot easily forget, when in January, 1903, I assisted at one of these operations for the first time. The operation was already in full progress and could easily be observed through the glass ceiling of the chamber. Sauerbruch with an assistant was in this most primitive box in which the operators could scarcely stand upright. After the resection of the sternal portion of a great number of ribs both lungs lay bare. The pericardium also was laid bare and through an incision in this latter the heart was in view. Each one of these organs was carrying out its physiological function before the very eyes of the observers. The heart made its rhythmical contractions, the lungs their inspiratory and expiratory movements, at the same time expanding wonderfully. My astonishment increased when I beheld Sauerbruch removing all the ribs up to within a short distance of the vertebral column, without interfering in the least with the respiration. Like so many interesting phenomena in the realm of physiology, this surprising fact has been given to us through Sauerbruch's work, namely, that the active work of the thorax to which the action of the lung is bound, is sufficiently kept up if only half of the diaphragm and some insignificant remnants of ribs with the most necessary muscular attachment remain. I should like to ask here whether we are not justified in interpreting this surprising phenomenon much more in this way, that the lung itself takes an active part in the inspiratory expansion, a possibility which, as you know, has been denied until now.

During the first month of 1904 Sauerbruch operated on from seventy to eighty dogs by this method, a great number of which survived for a longer or shorter time after those very serious surgical operations upon the lungs, the mediastinum, the heart, and the œsophagus. A considerable number have remained alive. A number of the others died from infection, which as you understand can scarcely be avoided in dogs. Frequently aseptic and careful operating was not even attempted.

The method had advanced to this point when Sauerbruch and v. Mikulicz presented it to the Surgical Congress in Berlin. Up to this point also the first publications go, which you will find with all their technical details and physiological discussions in Sauerbruch's and v. Mikulicz's articles.¹

The results obtained until then were so encouraging that a man like v. Mikulicz had a right to dare to attempt the operation on man;

¹ Zentralb. f. Chirurgie, 1903 and 1904; Verhandl. der Deutsch. Gesellsch. f. Chir., 1904, and especially in the *Mittel. aus den Grenzgeb.*, 1904, Heft 3.

the more so as it almost always concerned cases otherwise incurable and fatal, or localities which until now had been inaccessible to the knife of the surgeon.

Professor v. Mikulicz, who had followed the entire development of the method with lively interest, now had a cabinet built in his clinic on a grand scale, which not only cost a great deal of money, but also produced many technical difficulties. This chamber has the shape of a cube and contains forty cubic metres of space. Floor and ceiling, as well as the four walls up to about one metre in height, consist of strong iron, the rest of the walls of very strong glass. The whole thing is constructed absolutely air-tight, as well as the double door which is held tightly closed by means of an iron beam pressing against a thick rubber incasement. Opposite this there is exactly, as in the original dog chamber, on a level with the operating table, a circular hole which is closed by a rubber septum. The hole, again, has a circular opening through which the head of the patient can be forced without difficulty, whereupon the septum spontaneously closes around the neck like a cuff. A third wall bears the evacuating apparatus consisting of a suction pump which is driven by a one-horse power electromotor and which has a suction power of three hundred litres per hour. Next to it there is a valve which permits the renewal of air within and regulates the rarefaction of air with respect to the air pressure. All this is managed inside of the cabinet. In case the electromotor should accidentally stop working there is a hand pump in reserve. A negative pressure of ten millimetres of mercury proves to be sufficient to guarantee the expansion of the lung. As far as I can remember, the air pressure was approximately fifteen millimetres below the atmospheric pressure.¹ The entire chamber, therefore, corresponds quite closely with the little experimental cabinet and only in one respect does it differ essentially. Since the atmospheric pressure upon the entire venous system is increased in this chamber the venous circulation would naturally go on considerably slower, the aspiratory work of the pleural cavity would be much diminished, and in this way more work would be exacted of the left ventricle. This obstacle is overcome by placing the whole body of the patient, from the ribs down, into a rubber sac which communicates with the outer air, thereby keeping out the influence of the pneumatic cabinet and placing the venous system under the ordinary atmospheric pressure. But this sac was not used in connection with all our operations. The cabinet is lighted by an electric arc light fastened to the ceiling; a transportable incandescent light is also at hand.

Let us now proceed with the operation: The patient, not yet fully anesthetized (chloroform being preferable to ether), is brought into the cabinet and placed upon the table, his head, forced through

¹ The operations are now performed at a pressure of -6 to -12 mm.

the rubber cuff, rests outside upon a small table, beside which the anæsthetist has his seat. The door of the cabinet is closed and the apparatus set in motion. There is just room for the operator, two assistants, one man who handles the instruments and another who attends to all the mechanical apparatus. Besides that there is room for two small tables on hinges on which the instruments, the dressings, and the irrigating fluids are placed. As soon as the manometer shows an air pressure of minus twelve to fifteen millimetres the operation begins.

By this time it is likely that various doubts have arisen in your minds. You will ask, Is not the anæsthetic most difficult under such conditions? Well, taking for granted that we have a conscientious and capable anæsthetist the narcosis can be carried out in the usual way and I cannot say that we had any more accidents in the cabinet than under ordinary conditions. The anæsthetist, as well as the operator, can watch the pulse. One need not fear the compression of the neck and its vessels by means of the rubber cuff, although the latter substance clings very tightly under the atmospheric pressure. Besides being able to use a sign language the operator and anæsthetist are in communication by means of a telephone. Nevertheless, it must be admitted that in cases of immediate danger, such as asphyxia, etc., it is somewhat more difficult to employ energetic measures than under ordinary conditions. The body of the patient is, as one might say, divided into two parts: the anæsthetist who is outside cannot come near the trunk and those inside the cabinet cannot reach the head. Possibly you will wonder how the operator fares within this cabinet. Well, I have myself operated for hours with Professor v. Mikulicz in this chamber and I can assure you that I felt quite well. To be sure the activity of the sudoriferous glands is increased, but operating in our cabinet is no worse than in the tropical heat of an operating-room facing the south and exposed to the rays of a noonday sun. Sauerbruch calculated that in the cabinet with a negative pressure of ten millimetres of mercury one lives under the same atmospheric pressure as on a mountain of three hundred metres. This certainly does not indicate any marked difficulty in breathing.

I am afraid that I have already gone too far into detail in the introductory part and in the consideration of the technicalities of the method, and now turn to that which will interest you most, the results we obtained in our operations on man. I judge the number of the operations performed in the cabinet during the months of May, June, and July was at least a dozen. I regret that I cannot give any reliable statistics, since at this moment I have no data at hand, so I must depend entirely upon my memory.¹ Moreover, as an assistant of the private clinic, it was not possible for me to follow closely those patients which were operated upon at the University

¹ I am now able to furnish exact data: There were 5 operations on the œsophagus, 1 on the heart, 8 on the lungs, 2 on the thorax.

clinic. Among these, there were operations upon the lung, the œsophagus, the heart, and the thorax itself. First I will speak about the œsophageal cases, as in the entire undertaking v. Mikulicz had the œsophagus principally in mind and it was just in this direction that he had placed his hopes on the new method. The œsophagus lies so hidden and covered by vital organs that the gaining of an entrance is of itself difficult and venturesome. After all attempts at preventing a pneumothorax from the front proved in vain the attempt was made to accomplish this from the back. Although in individual cases, in experiments upon animals, one succeeded in preventing the opening of the pleural cavity, this way also soon proved inadequate. Before all else v. Mikulicz intended to attack this inaccessible region with the help of the pneumatic cabinet, but it was just this part of the work which did not turn out encouragingly. To be sure, on dogs, we succeeded in resecting a couple of inches of the œsophagus and in uniting the ends, and even if the animals finally died it was for the most part due to the fact that it was impossible to keep them properly quiet and to nourish them through a stomach fistula. Since this annoyance can usually be avoided in a human patient one had a right to expect that in man results would be better. Alas, we encountered here other great hindrances. Among these in the first place was the shock, which was produced by displacement of the lung or occasionally of the heart, and by operating at such a depth; it was so enormous at times that threatening phenomena appeared and the operation had to be stopped. Or a carcinoma proved inoperable after laying the œsophagus bare. A few times it resulted in infection and empyema.

A woman who had carcinoma of the œsophagus was put under my special care and I followed the course of the treatment with special attention. In this patient we had previously established a stomach fistula which had improved her nutrition essentially. She was only thirty-eight years old and the œsophagoscope, which in our clinic was used in every œsophageal case, showed a small, circumscribed tumor, which after an exploratory excision with the help of the œsophagoscope, proved, microscopically, to be an epithelioma. The case seemed to be particularly favorable for an operation and yet it was the one which of all our cases ended in the saddest way. Soon after the opening of the pleural cavity and the displacement of the lung, the patient became dyspnoic and pulseless, and succumbed soon afterward. Whether this is to be attributed to the narcosis or shock I do not dare to say. The case was a mystery to us all. We used in this instance preoperative injections of nuclein to produce a hyperleukocytosis to combat, if possible, peritoneal infection. These injections were used in all our cases in which the digestive tract was operated upon. It may be that this had something to do with the causation of death. The woman showed a very bad reaction even before the anæsthetic was started. There was some fever

and a pulse frequency of 176. In short this unfortunate event was never cleared up.

Two other cases of œsophageal carcinoma were operated upon. After exposing the tumors they were found to be inoperable. Both of these patients died from pleurisy. The danger of infection is always great, as the pleura is much more vulnerable to infection than is the peritoneum.

I should like to describe to you here a little more in detail the v. Mikulicz method of operating, in order to make it clear to you that these operations upon the œsophagus must necessarily always produce a severe shock. We must give up trying to build a large thoracic flap in order to have an easy way to get at the œsophagus, since this would render an air-tight after-union impossible, or at any rate very tedious. So we perform the simple thoracocentesis in the fourth intracostal space through an extensive parallel incision. The wound is then forced into a wide gap by forcibly tearing the ribs apart by means of an automatic retractor which is constructed like the one used for tracheotomy, only being much larger and stronger. This act, which frequently requires considerable strength, as well as the separation of the lungs, is especially apt to produce severe shock. In fact, the resection of a rib or two is sometimes safer and may be preferable to that violent procedure. The remaining instruments are the same as are generally used at the clinic, only the scissors, forceps, needle holders, etc., must be considerably longer. Manipulating them must also be learned. Hence as long as I was connected with the clinic the results of our œsophageal operations were not satisfactory.

Furthermore, several cases of gangrene of the lung were operated on, as far as I know with good results. I know you will say "gangrene of the lungs has been operated upon with good results long ago." To be sure, not only that, but there has even existed an established surgery of the lungs, which was developed into its modern form and with its special technique by Quincke, of Kiel. I know from my assistantship in Hamburg-Eppendorf that Lenhartz got very good surgical results in his work on gangrene of the lungs without the aid of the pneumatic cabinets. These, however, were only very lucky cases, so-called show cases, which had been especially selected. He decided to operate only when there were, in all probability, pleuritic adhesions and when the location of the lung focus could be previously determined with comparative certainty. Everyone knows how difficult this is at times, but to search for the focus during the operation was, candidly speaking, impossible. In the pneumatic chamber, however, this could be done with complete composure. A good result was achieved in a case of bronchial fistula.

I also witnessed an operation upon the heart which was performed by one of v. Mikulicz's assistants. It was a stab wound. The man was brought into the chamber in a collapsed condition, but with a

fairly good pulse. After resecting two or three ribs the pleural cavity was opened. The lungs expanded beautifully and after dissecting several layers of tissue the operator thought that the heart, covered with blood clots, lay before him, while in fact it was only the pericardium. The whole appearance of the heart had been changed to a great extent by the fluid infiltration and suggillation. This unfortunate mistake was fatal to the patient. Without it we would have found the wound of the heart more quickly and could have sutured it and possibly saved the patient. Finally, after opening the pericardial cavity and removing the large amount of coagulated blood which filled it, and when the stab wound of the heart muscle was in plain sight, the patient had already bled to death. As you will see, the technique of operating upon the heart and pericardium, also, is modified by the use of the pneumatic chamber, since the discussion about the best and least dangerous point of entrance to the heart is of no importance at the moment when one no longer has to fear the opening of the pleural cavity. We have forerunners in this field of activity also. I recall Rehn's bold deed, Pagenstecher and others, but this field, like surgery of the lungs, has remained very sterile until now.

Finally, I can report a case of surgery of the thorax in which I assisted Professor v. Mikulicz. It was a sarcoma of the thorax the size of an apple, surrounding the third rib and situated above the nipple. The tumor was resected together with a portion of rib the length of a finger. Again the lung expanded beautifully. It took some time to control the bleeding. The thoracic wound was then closed by suturing the anterior costal and pectoral muscle with strong catgut and by exact union of the skin. The whole operation was done without hurry and without the least disturbance. Pulse and respiration of the patient continued good during the whole time. In spite of the fact that because of the considerable loss of blood and our customary normal salt solution irrigations some fluid had collected in the pleural cavity, so that I noticed a hydrohematothorax the next day. In spite of this the recovery was perfect; the patient was discharged on the ninth day and soon afterward sent to her Russian home.

By microscopic examination I was able to determine a mixed-celled sarcoma.

An extensive carcinoma of the breast which had grown into the thoracic wall was operated upon with perfect result. A large skin-muscle-flap was set upon the expanded lung.

If I may be allowed to return once more to the subject of oesophageal operations I would say that the cause of our meagre results does not lie in the inefficacy of the cabinet, but rather in the technical difficulties which under all circumstances go hand-in-hand with operations for carcinoma of the oesophagus.

These difficulties are caused: first, by the location of the organ;

second, by its anatomical condition; and third, by the imminent danger of an infection of the pleural cavity.

First. The operation is performed at a great depth, the operator struggling with the lungs, which are constantly pressing forward and which can be kept back only with much difficulty by means of broad depressors or retractors. Care must be taken not to injure the vagus nerves. The aorta and its numerous branches lie dangerously near. If we are fortunate to succeed in resecting the diseased piece of the œsophagus, we have yet the more difficult task of reuniting the latter. In the first place the œsophagus is not at all movable, since it is just long enough to go the shortest way from the stomach to the mouth. Furthermore, it is tightly adherent to a broad support by means of strong connective tissues. Thus the suture naturally suffers a dangerous tension.

Regarding the frequently occurring carcinoma of the cardiac end, the difficulty can be eliminated by a technical manœuvre, which v. Mikulicz first applied with success in his experiments upon the dog and which he has transferred upon the human body in his experiments upon the cadaver. The cardiac end of the stomach can be pulled up directly through the œsophageal opening in the diaphragm and in this way it can be united with the proximal segment of the œsophagus. Notwithstanding this fact it is, however, difficult to secure a safe union, because in this position it is unfortunately not possible to cover the line of suture throughout with serous membrane, after the manner which is employed so advantageously in intestinal suture, because the œsophagus is only partially covered with pleural tissue, which, moreover, is movable only to a slight extent. On this account it is scarcely to be expected that an œsophageal suture will ever be as safe as an intestinal suture. For this reason it is necessary to make use of drainage, which in turn threatens an infection of the pleural cavity. In order to prevent the formation of a pneumothorax because of the presence of drainage after the completion of the operation, we have constructed a contrivance out of rubber which makes an air-tight closure over the dressing covering the thorax. I will show further on how Sauerbruch, in his latest experiments, has overcome these difficulties.

It does not seem to me that this report about clinical experience is entirely discouraging. It is to be expected that further improvements will be made in the construction of the cabinet. Dr. Gaylord, of Buffalo, New York, has written me that he has constructed a cabinet. It is quite possible that he has already improved upon the original. Others are built in Paris, Berlin, Leipsic, Cologne, Greifswald, New York. Professor Tuffier, of Paris, has taken a special interest in the work. He has experimented on a large scale, and expressed himself in favor of the method.

At this point it is proper to refer to a recent method which may possibly take the place of Sauerbruch's cabinet, and which undoubtedly

has the advantage of greater simplicity. In the beginning of my paper I touched upon the possibility of reaching the same end by another route: namely, by producing an increased pressure within the bronchi, due to the physical difference between bronchial and pleural pressure. This is the so-called "Überdruckverfahren." This method was studied by Brauer and Peterson, of Heidelberg, during 1904 and following Sauerbruch's work. Many years before this, however, similar apparatus had been employed. The French surgeons, Tuffier and Hallion, and also your countrymen, O'Dwyer and Matas, have made very interesting and valuable experiments in this direction. Their experiments consist essentially in inflation of the lungs by means of bellows, as you understand, in a kind of artificial respiration, but they did not attain a practical result as the methods were insufficient. An improvement was invented by Matas, which consisted in the use of a graduated air pump. This method has as yet not been applied practically to a great extent. Brauer was the first one to work out this "Überdruckverfahren" in a practical way. He developed a method in which he made use of a small cabinet with positive air pressure. This cabinet contains approximately one-third of a cubic metre air space, in which the air pressure exceeds the normal atmospheric pressure to a sufficient extent to keep the lungs expanded. The head of the animal is inserted into this cabinet through a diaphragm, in a similar manner as in Sauerbruch's cabinet, the body remaining outside; the anaesthetist also introduces his hands into the cabinet through rubber cuffs and carries out the anaesthesia with an appropriate apparatus. Petersen has in this manner successfully operated upon the heart and lungs on a number of dogs. The simplicity and diminutive size of this apparatus undoubtedly has many advantages, but it seems to me that the anaesthetist works at a serious disadvantage under the conditions described above. Sauerbruch himself considered this method before it was developed in Heidelberg. He also made a number of experiments in this direction, but later abandoned the method because it seemed to him that there were many objections to its use, which I cannot discuss in this paper because of lack of time.

Although there has been little or no work done with the cabinet since my departure from Breslau, due to the paralyzing effect of the long illness and death of the Chief of the Clinic, and while there have been no more operations on man, still the indefatigable inventor has brought his work much nearer to perfection.

The results had been bad enough so far as suture of the œsophagus and infection of the pleura are concerned. We could all see that improvement here was imperative if future progress was to be made. Sauerbruch lost no time. While the surgical world began to look skeptically at the whole matter, he went back to animal experimentation, using now the larger chamber. It was self-evident that

many improvements in the technique of operation must be made, especially in the œsophageal work. This was a most difficult but also a most attractive problem. The œsophageal suture was more difficult than all else. As I have already stated, the unfavorable anatomical structure of the wall of the œsophagus makes it almost impossible to get a tight circular suture. There is no serosa, a weak muscular coat and a mucosa of little vitality. There is always great tension after the resection of a segment. As the stitches nearly always cut through, no matter how they are put in, food passes into the pleural cavity and the animal dies from empyema and pyæmia. All kinds of devices have been employed to make the suture secure and lasting. The suture has been modified in numerous ways, but to no purpose. *The stitches cut through.* Mikulicz had been the first to avoid tension on stumps by bringing a part of the stomach through the diaphragm and using it as a plastic covering for the œsophageal suture. This also made the suture more secure. Sauerbruch combined this idea with the use of the Murphy button, thus avoiding the suture entirely. In this way he obtained such good results that he claims the *Murphy button* to be the *conditio sine qua non* of all success in this work. He has operated upon dozens of dogs, all of which got well. These dogs now take all kinds of food except bones. In each of these dogs a piece of the œsophagus was resected, in some as much as three inches. The essential points in the operation are the intrapleural displacement of the stomach and an anastomosis between the œsophagus and the stomach by means of the button.

I might briefly describe the operation as follows:¹

The animal is brought into the cabinet and fastened upon his right side. The pleural cavity is opened in the fifth intercostal space and the ribs are separated by the Mikulicz automatic rib retractors. The lung is pushed aside, whereupon the œsophagus and aorta and both pneumogastric nerves appear. We catch the œsophagus with a tenaculum forceps just above the hiatus, stretching it a little, and make, close to it, an incision into the septum diaphragmaticum which here consists entirely of pleura and peritoneum. This opening is sufficient to pull through the fundus ventriculi. The next step is the introduction of the Murphy button. This is done by an assistant outside the cabinet. With a bougie he first introduces the female half of the button, through the œsophagus as far as the stomach cavity. There it is caught by the operator and brought into that part of the fundus which was displaced into the pleural cavity. Here a very small incision is made through which the button is forced. The other half is introduced and pushed against that part of the wall of the œsophagus where the anastomosis

¹ Sauerbruch's Publications in *Zentralblatt f. Chirurgie*, 1905, No. 4; *Verhandl. der deutsch. Gesellsch. f. Chir.*, 1905, and principally in *Mittheil. aus den Grenzgeb.*, 1905, 2.

is to be performed. A small incision is also made here, the button adapted to it, and both halves brought together and closed. No suture whatever is made. The last important step is the fixation of the fundus ventriculi to the diaphragm. It is done by suturing the protruding stomach all around the slit in the diaphragm. Of course the operation must be modified in some special points when performed upon man and under pathological conditions. When the button cannot be passed down the œsophagus, as will be the case in most benign strictures, in diverticula, and even in most carcinomatous conditions, the button must be introduced per ventriculum. In carcinoma, the resection should be done after the establishment of the anastomosis. When the anastomosis is finished, a strong silk ligature is passed around the œsophagus below the button and tied tightly. The carcinomatous piece of the œsophagus is then dissected off after isolation of the pneumogastric nerves. The lower end is closed in the same way and in addition is inverted in the stomach and buried by a purse-string suture exactly like an appendix. The upper stump is now covered by the fundus ventriculi.

All these procedures have been effectually carried out on the cadaver and there is no doubt that they will be applied to the living subject as soon as a new chief of clinic is appointed. Although the results which have so far been obtained have been only moderately successful it must be remembered that they follow only the earliest observations. When considering the three operations for carcinoma of the œsophagus we must remember that they were done before Sauerbruch's latest improvements in operative technique.

There is no doubt but that the opinion of Professor v. Mikulicz, which he expressed at the Congress in Berlin in 1904, is correct, when he stated, that we are entitled to the expectation of better and more satisfactory results. He hoped to be able to attack, aside from the above mentioned conditions, also injuries and defects of the diaphragm. He even suggested the possibility of interfering with certain valvular heart lesions, an American surgeon having already mentioned the incision of mitral stenosis. It would seem to me, that the method might be successful especially in the extraction of foreign bodies from the bronchi, for the treatment of diverticula of the œsophagus, and more especially for the removal of foreign bodies impacted in this organ. All of these operations would, of course, promise much better results than the carcinoma of the œsophagus. Naturally, the new method will first have its fatal results as has every other new operation. On the other hand, it must be remembered that the victim of carcinoma of the œsophagus has, without operation, only to await a certain, slow, and dreadful death. Should he recover from the operation he has a good chance for his life, as carcinoma of the œsophagus grows slowly, involves only late the neighboring glands and makes very late metastases to other organs. So we can easily see that here, as in many other

surgical conditions, an early diagnosis is essential. Sauerbruch remarks: "If cases of œsophageal carcinoma are sent to the surgeon in time, there will certainly now and then be found a case suitable for operation. That will likely, however, be true only far in the future." I have just received a letter from Sauerbruch in which he tells me that v. Mikulicz himself said to him only a few days before his death: "With our method we will make possible an operation for carcinoma of the œsophagus."

Das klingt ganz anders als der trostlose Ruf, in den bisher jeder Forscher nach vergeblichen Mühen und Arbeiten auf diesem Gebiete ausgebrochen ist: *Lasciate ogni speranza!*

THE SURGICAL TREATMENT OF HEPATIC CIRRHOSIS, WITH SPECIAL REFERENCE TO BILIARY DRAINAGE.

BY CHARLES GREENE CUMSTON, M.D.,

SURGEON TO THE FLOATING HOSPITAL, BOSTON.

IN the issue of the *Boston Medical and Surgical Journal* for August 11, 1905, I published a paper relative to the value and indications of omentopexy in cases of cirrhosis of the liver with ascites, but in the present paper I intend only referring to drainage of the biliary tract in certain cases of hepatic cirrhosis. The surgical treatment of this condition has been simple exploratory laparotomy, laparotomy combined with destruction of adhesions, with or without massage of the biliary tract, and lastly, laparotomy followed by cholecystostomy. The first two interferences are not within the limits of this paper and consequently I will not refer to them again.

In the first place I would rapidly consider the most essential facts relative to the pathogenesis of hepatic cirrhosis, which may be defined as a generalized proliferation of interstitial tissue, accompanied by various pathological changes in the hepatic cell. In other words, a cirrhosis merely represents a chronic hepatitis which is the ultimate stage of an irritative process of the liver, having for a starting point the biliary tract or the bloodvessels. It is at the present time an established fact that infection is the primary etiological factor in certain cases of cirrhosis, the infectious agent being propagated from the intestine to the liver by way of the biliary tract. Hypertrophic biliary cirrhosis with chronic icterus represents the most perfect type of this morbid condition. But, in order to understand fully this question of hepatic pathology, one should not forget that roughly speaking the liver may be reduced to an hepatic cell, united to the intestinal tract by an excretory canal. The latter is in direct continuity, both anatomically and physiologically, with

the hepatic cell and represents one of the means of draining the liver, this duct is in direct continuity with the intestine and partakes of the pathological vicissitudes of the latter; and it may be safely stated that the sclerous process is the result of microbic invasion from the gut.

In the normal condition the biliary tract may be considered as absolutely aseptic and this normal asepsis also exists in the hepatic parenchyma, in very great contrast with the intensely septic condition of the intestinal mucosa which abounds in micro-organisms. I would, however, add that the last portion of the choledochus is normally the abode of two organisms, namely, the bacterium coli and the staphylococcus aureus. There consequently exists at the point of the anastomosis of the biliary tract in the intestine a transitional zone whose microbic flora is practically certain. As to the intestine, it is, on the contrary, the ordinary home for a large number of bacteria, and Gessner, as far back as 1889, made the statement that he always was able to discover the following organisms: 1. The bacterium tholocideum, a short oval bacillus, coagulating milk and pathogenic for mice. 2. The bacterium coli. 3. Two other bacilli, one of which liquefies gelatin. 4. Two staphylococci, one yellow and the other an orange yellow, liquefying gelatin. 5. The streptococcus pyogenes duodenalis, in all probability analogous to the streptococcus pyogenes aureus, so well known in pathology.

From this fact the biliary tract is in constant danger of infection from the numerous intestinal bacteria, and since the digestive tract is open to all kinds of external infections it may become infected occasionally by the most varied types of bacteria. Consequently, when the frontier which separates the aseptic canalicular zone from the infected intestinal zone is involved, an ascending biliary infection results. The bile and the walls of the biliary tract then offer all the necessary conditions for the culture and development of the various organisms, an angiocholitis being the first step of hepatic cirrhosis, the process being thus definitely created. However, before exposing the anatomical changes set up in the liver by chronic infection of the biliary tract, I shall endeavor to show that the part played by infection in the pathogenesis of biliary cirrhosis is based on precise facts. If, in the first place, we examine the bacteriological researches which have been undertaken on the bile of patients afflicted with cirrhosis, it at once becomes evident that the examinations have been invariably positive. For example, in Gilbert's case, an organism was found which differed from Escherich's bacillus in some of its characters, while in another instance an organism similar to the bacterium coli was discovered, and in Michaux's case the bile was infected by the colon bacillus, likewise in the case recorded by Pauchet. The presence of numerous pneumococci was easily made evident in Lejars' case. In my own cases

the bacterium coli was present in two and this organism in association with the staphylococcus aureus was found in the third. Pus has even been met with in the liver of cases of hypertrophic biliary cirrhosis, and Sabourin as far back as 1884 described a suppurating angiocholitis in this affection. A cloudy and purulent fluid has occasionally been found in the gall-bladder in cases of cirrhosis, and Hanot, Charcot and Gombault consider that hypertrophic biliary cirrhosis is in close relationship to those instances of hepatic cirrhosis following biliary lithiasis or experimental ligature of the choledochus when the biliary tract has been infected by bacteria. And still more, Charrin and Roger have been able to reproduce the lesions perfectly in their experimental work by directly injecting living or sterilized microbic cultures into the choledochus, while Gastou in 1895 developed the theory that Hanot's disease, to a certain extent, realizes the perfect type of infectious liver. In his remarkable memoir on cirrhosis, Chauffard, after having put aside intoxication as the probable cause of the sclerotic process, declares that many plausible facts plead the cause of infection *a priori*, and he adds that at a given time it surely intervenes in the form of an ascending biliary infection, even a pyogenic one, whose starting point must certainly be the intestine. Gilbert and Surmont unhesitatingly unite in one group the biliary cirrhoses which are, according to their way of thinking, infectious and they consider Hanot's disease as a consequence of an ascending infection of the biliary tract by bacteria coming from the intestine. From all this one can only conclude that the infection is foremost in the etiology of the sclerous process. Then, again, it may be added that in the affection that we are now discussing one will find the lymphatics of the hilum of the liver hypertrophied, as well as an hypertrophy of the spleen, leukocytosis accompanied by paroxysmal elevation of temperature, all of which are evident manifestations of an infectious process. The presence of bacteria having been demonstrated in biliary cirrhoses, two theories have been exposed based upon this fact. In the first a real pathogenic part is supposed to be played by the bacteria, which, in themselves alone, are sufficient to engender an infectious sclerosis, while the second hypothesis is that hypertrophic cirrhosis is accompanied by secondary infection. It matters very little, however, what explanation is admitted, and it is none the less true that at a certain time in the process there is infection.

Let us now consider the pathogenesis of the glandular and secretory apparatus of the liver, set up by the evolution of the infectious process. I have already pointed out that the biliary tract, which is aseptic in the normal state, is constantly menaced by the intestinal bacteria which are held in check by the physiological functions of the bile, and especially the hydraulic pressure resulting from the flowing off of this fluid. Now, if for any reason this equilibrium is interfered with, the intestinal germs will invade the biliary tract and

the infection will undergo its evolution under the form of an ascending catarrhal and obliterating angiocholitis. This catarrhal process ends in sclerosis of the biliary apparatus. At the International Medical Congress in 1897 Gilbert and Surmont expressed themselves as follows:

"L'infection peut s'être limitée aux gros conduits, à la vésicule; la paroi biliaire n'est pas toujours atteinte dans toute son épaisseur et avec la même intensité; la muqueuse peut avoir été seule lésée et même uniquement dans sa partie superficielle. On conçoit donc la possibilité d'un retour à l'état normal ou de la persistance d'altérations insignifiantes. Que l'on envisage par contre une de ces infections atteignant les voies intra-hépatiques, persistant sous forme de poussées pendant des mois et des années; les lésions des canalicules, l'infiltration leucocytaire des zones biliaires, l'apparition des cellules fusiformes à leur niveau, l'élargissement des espaces portes et la formation des néo-canalicules, l'envahissement conjonctif inter et intra-lobulaire; tels sont les résultats anatomiques successifs d'un tel processus; tels sont, en particulier, dans un certain nombre de cas, les résultats des angiocholites calculeuses. Elles aboutissent à la cirrhose biliaire. Il faut ajouter que dans ces circonstances la cellule hépatique reste pendant longtemps intacte ou qu'elle subit même l'hypertrophie et l'hypergénèse. Ainsi se trouvent donc réalisées des lésions identiques à celles qui caractérisent l'affection qu'Hanot a individualisée sous le nom de cirrhose hypertrophique avec ictère chronique. Dans les deux cas le processus pathogénique et le processus anatomique sont les mêmes; mais ici, il s'agit d'une cirrhose biliaire infectieuse spontanée ou sans obstruction, et là d'une cirrhose biliaire infectieuse avec obstruction."

To sum up, Hanot's disease is merely a subacute, ascending catarrhal, and obliterating angiocholitis, susceptible of becoming combined with cirrhosis, the latter being only a secondary phenomena added to the lesion of the biliary ducts. This is why in biliary cirrhosis, the result of microbial invasion, the particular form of the process after a time sets up irritative lesions rather than pyogenic ones of angiocholitis and chronic radicular periangiocholitis, and for this reason it is quite natural to foresee the excellent results that drainage of the infected biliary apparatus can give.

A word now as to venous cirrhosis, because one or two such cases have been submitted to surgical treatment and in one, at least, the condition of the patient was very markedly improved after drainage of the biliary tract; the ascites did not recur, the icterus disappeared and the general condition was greatly improved. This happy result causes me to query as to whether or not it is not logical to admit that infection also plays a part in this type of hepatic sclerosis where the agent of infection reaches the liver by way of the blood and the part played by infection appears to me most plausible on account of the fortunate result obtained by operative

interference. I would also recall in this respect that certain authorities have generalized the doctrine of infection to venous cirrhosis, thinking, for example, that, *a priori*, in cardiac cirrhosis or the hard nutmeg liver it is very unlikely that one is dealing with disturbances in the circulation only and that there must also be concomitant infection or intoxication, as has been expressed by the authors in the *Traité de Médecine*, edited by Brouardel and Gilbert. These same authorities state further on that it has been experimentally demonstrated that if biliary cirrhoses are of an infectious nature, vascular cirrhoses may be either toxic or infectious.

In considering the indications for operative treatment I will consider separately hypertrophic cirrhosis with icterus and hypertrophic cirrhosis without icterus: the first corresponds to the affection known under the name of Hanot's disease, while the second represents a class of badly defined chronic hepatitis, as yet insufficiently studied, but united to the former class by a mere pathogenic parentage; and thirdly, we have the vascular cirrhoses. In hypertrophic cirrhosis with icterus surgical interference is indicated for several reasons, the first of which is the absolute failure of medical treatment in the case of a disease which is inevitably fatal. I believe that physicians generally admit that in this affection the prognosis is unusually serious and that, although the evolution of the process is ordinarily quite slow, all cases observed up to the present time have ended fatally. Consequently, when these patients are left to themselves they are condemned to death, because no matter what medical treatment may be followed, even for a long time and under the best conditions, it is absolutely powerless to put a stop to the ever progressing evolution of hepatic sclerosis. Secondly, surgical interference is absolutely benign, and in this respect I would recall the opinion of Terrier, who says: "Il est, en effet, certain que l'exploration du foie, après incision sur la ligne médiane, est une chose possible, presque facile et d'une innocuité indiscutable des qu'on utilise la méthode antiseptique, soit même la méthode mixte à la fois aseptique et antiseptique." And, still more, if one takes into consideration the operative results of cases so far reported, it will be found that the operative mortality has been excessively low. I believe for all these reasons that a well-conducted cholecystotomy is practically devoid of any operative gravity and the patients submitting to this operation run little or no risk. Thirdly, we have the happy results obtained by surgical interference and the question comes up as to whether or not the operative cure has given rise to therapeutic successes, both immediate and definitive. Without relating the many brilliant recoveries obtained by Terrier, Michaux, Delagenière and others I will merely add three of my own, which practically represent what others have experienced.

CASE I.—M. H., a young man, aged twenty-four years, enjoyed excellent health up to the summer of 1901. At this time he com-

menced to experience the symptoms of acid dyspepsia accompanied by attacks of gastric pain. For five months these became more and more frequent and were frequently followed by icterus, while the general condition of the patient became poor. During the attacks of pain it appeared as if the gall-bladder was the seat of the trouble, but finally it extended over the liver. These attacks of pain and the icterus made me suspect that the patient was afflicted with gall-stones, although a careful examination of the stools after these attacks failed to reveal the presence of even the minutest calculus. The patient became worn out by constant pain, and, as he was losing flesh rapidly, operation was decided on in November.

Examination of the patient at this time showed that he had slight icterus; evening temperature 100.6° F. Digestion was difficult, the stools clay colored, and the urine contained biliary pigment, but no albumin. By percussion the liver extended two fingers' breadth below the ribs and palpation of the gall-bladder was painful. The heart and lungs were normal.

On November 27th the abdomen was opened in the semilunar line and the gall-bladder was found buried in quite dense adhesions, but careful exploration failed to reveal the presence of calculi either in the gall-bladder or in the ducts. The liver was enlarged, but regular in shape. After walling off the cavity the fundus of the gall-bladder was incised, giving exit to a dark purulent bile, and the finger introduced within its cavity showed that no calculus was present. The gall-bladder incision was enlarged and the walls were found thickened and soft, and after having carefully explored the under aspect of the liver and ducts for the second time cholecystostomy was decided upon, a large drainage tube being introduced into the organ. The results of this operation were perfect: there was no rise in temperature after the operation, and on the second day the dressings became soaked with bile, and at the same time the patient expressed himself as feeling greatly relieved. The drainage tube was allowed to remain for seventeen days, at which time the bile had taken on all its natural attributes, the icterus had completely disappeared, and the patient digested perfectly everything he ate. The drain was consequently removed and the patient was discharged in excellent condition with the biliary fistula closed twenty-seven days after the operation. Bacteriological examination of the bile taken at the time of the operation showed the presence of the bacterium coli and the staphylococcus aureus in large numbers.

I have followed this case since the operation and the patient has remained in perfect health ever since.

CASE II.—The second patient was a young woman, aged twenty-seven years, who gave the following history. She had been married two years and had had one labor at term, without complications. Five years ago typhoid fever, apparently rather severe. Menstruation always regular and painless. No history of biliary

calculi. However, I suspected from certain things that the patient was addicted to the use of alcohol. When the patient came under my observation she had been suffering from pain in the region of the gall-bladder for some nine months and had recently become quite cachectic. She was a frail woman and complained constantly of pain in the pit of the stomach, and which extended to the right side. Examination of the thorax negative. The urine was scanty, averaging about 750 c.c. in twenty-four hours, having a slightly acid reaction and a deep orange hue. Examination showed that it contained slight traces of albumin, a certain amount of pus, and bilirubin.

Upon physical examination of the abdomen the region of the liver felt tense and this apparent tumefaction extended to a little beyond the median line. It was hard and appeared somewhat movable, but was in no way connected with the genital organs, although it extended nearly to the right iliac fossa. As I could not make up my mind as to the diagnosis an exploratory incision was advised and accepted. An incision was carried from the costal border to below the umbilicus in the semilunar line, and when the peritoneum was opened the tumor was found to be nothing more than a greatly enlarged liver. The shape of the organ had, however, been preserved. The gall-bladder was exceedingly enlarged and sausage shaped, but no calculi could be felt either in the gall-bladder or the ducts. By raising up the border of the liver with the hand inserted deep into the abdomen it was an easy matter to bring the gall-bladder into the abdominal incision. On account of the apparent changes which the hepatic parenchyma had undergone, as well as the condition of the gall-bladder, I decided to do a cholecystostomy followed by drainage of the gall-bladder. This was carried out according to Delagenière's technique, which I will describe farther on, but was somewhat difficult of execution on account of the projection of the liver border.

The temperature which had oscillated around 102.2° F. before the operation dropped to the normal on the second day, and for the first four days following the interference a large amount of mucus was discharged from the gall-bladder. Bacteriological examination showed that this fluid contained the bacterium coli in large numbers. On the fifth day, however, the fluid from the drainage began to take on the appearance of bile, and during the next four days it gradually transformed until nothing but pure bile was found on the dressing. To make a long story short, the patient rapidly improved, her digestion became perfect, and the temperature remained normal. The tube was removed on the twentieth day, after which the fistula rapidly closed and the patient was discharged in excellent condition thirty-seven days after the operation. She was ordered a strict milk diet, which was continued for three months, after which time she was completely cured, and as far as my knowledge goes has remained so ever since.

CASE III.—A male, aged fifty-six years, was referred to me for chronic jaundice and occasional painful attacks in the region of the liver accompanied by a rise in temperature, this condition of affairs having existed for fourteen months. The abdomen was considerably distended with fluid, the patient stating that the abdomen had continued to enlarge for the past three months. The general condition was very poor: the patient had lost considerable flesh, the liver extended three fingers' breadth below the costal border, and with some difficulty the spleen was thought to be felt enlarged. The abdomen was opened and a large cirrhotic liver was exposed, with evidence of chronic peritonitis in the infrahepatic region. The gall-bladder was greatly enlarged, its walls thickened, but no calculi could be found within it or in the ducts. The ascitic fluid having been let out a cholecystotomy with drainage was done.

After the operation the temperature remained normal; the tube was removed at the end of one month, after which the resulting fistula permanently closed in about a fortnight. The bile obtained at the operation contained bacterium coli.

The after events were simple. The icterus disappeared, the appetite came back, and the patient made weight. Four months after the interference the general condition remained excellent, but the fluid had again made its appearance in the abdomen, so that puncture became necessary, removing seven litres of a dark-yellow thick fluid. After this the patient remained perfectly well, I having had news of him a year afterward, at which time he was fairly well, there being no trace of jaundice, and, on the whole, he appeared well pleased with his condition. However, the advanced stage of the hepatic process will naturally not allow a permanent cure to be obtained in this case, and it is evident that the patient will ultimately die of the process, but the operation certainly greatly improved his condition and without doubt gave him a lease of life of several years.

The majority of the considerations put forward above, relative to the prognosis and the ineffectiveness of medical treatment, may also be applied to cases of hypertrophic cirrhosis without icterus, and in looking over the reported cases it is most curious to note that the results obtained by surgical interference have been very good, mostly all resulting in a radical cure, or at least a very evident improvement. As to vascular cirrhotoses, we may say in a few words what we have already indicated relative to hypertrophic cirrhosis with icterus: namely, that medical treatment is powerless to stamp out the process of sclerosis, although it should be remarked that contracted livers are less amenable to treatment than the large liver, and that the process inevitably terminates in death. That something may be gained by operative treatment in these cases, I believe is logical to suppose, and several cases have been reported

in which simple laparotomy has been sufficient to cause the ascites to disappear, likewise the cirrhosis itself in a few cases. Instances of this kind are numerous, but having no personal experience I will relate as an example one reported several years ago by Routier, where the patient was supposed to have a tuberculous peritonitis and an exploratory incision showed that in reality an atrophic cirrhosis was present; but the interesting part of the case is that the exploratory incision, followed by a few punctures for the ascites, afterward cured the patient in three months. In one of Delagenière's cases the question may arise whether it was the laparotomy or the drainage of the gall-bladder which caused the favorable result, but my own opinion is that the biliary fistula contributed greatly to the improvement of the patient's condition. Since the ascites did not recur it is probable that the drainage of the gall-bladder favorably influenced the phlebitis and periphlebitis of the portal and infrahepatic veins, and, so to speak, corrected the intrahepatic circulation, and, on the other hand, since the icterus diminished it is to be supposed that the drainage of the gall-bladder had a favorable action on the angiocholitis. However, we cannot draw any conclusions from a single case, and consequently it is only future experience which will teach us the truth.

Relative to the technique to be employed for draining the septic biliary tracts one may choose between cholecystogastrostomy, cholecystenterostomy, and cholecystostomy. The first two do not appear to be applicable to the cases that I am considering. The first is a very exceptional operation having special indications, while the second has the great inconvenience of turning back the infectious elements contained in the bile into the organism by throwing it off into the intestine. On the contrary, in cholecystostomy we have an ideal operation. The cutaneous fistulization of the biliary tract gives exit to the infected bile, and from this fact the biliary tract becomes thoroughly drained, even in its most remote intrahepatic ramifications, and, consequently, disinfection of the liver is admirably realized. The large majority of authors accept this way of thinking and consequently this operation is currently practised at the present time, but there is certainly a choice of procedure, because the classical cholecystostomy presents certain disadvantages. Without doubt the permanency of the fistula is the most serious objection, because it gives exit to a certain amount of bile continually and not infrequently requires a second interference for its closure, and, although there are numerous instances of patients who enjoy a satisfactory condition of health in spite of this loss of bile, it nevertheless is incumbent upon the surgeon to select a technique which will result in a temporary fistula. For this reason Terrier believes that one should make the fistula as small as possible in order to avoid a too abundant flow of bile and more especially in order to make the occlusion of the

fistula an easier thing to do. For the same reason Delagenière has worked out a technique by drawing the gall-bladder through a buttonhole made in the right rectus, so that the fistula will be more continent and more easily allow its closure. The opening of the gall-bladder is consequently furnished with a muscular sphincter, which holds the borders in contact as soon as the drainage tube has been removed. This change in technique has resulted in the formation of a true temporary cholecystostomy, the technique of which I will rapidly describe.

The incision is carried along the external border of the right rectus; in length it should be about 12 cm., a space which is usually sufficient for the introduction of the hand. Its starting point is at the costal border. Naturally the cutaneous incision should be longer than that of the aponeurosis and of the muscle, and the aponeurotic incision should be longer than that made into the peritoneum. In proceeding in this way there are many advantages which at once become evident and need no discussion. When the peritoneum is opened the gall-bladder is packed around with gauze sponges so as to prevent contamination of the abdominal cavity with the bile, the gall-bladder is drawn up and the fundus incised. After the bile has escaped the interior of the organ is explored with the finger and the field of operation being freely irrigated with salt solution in order to remove the septic contents of the gall-bladder, and the gauze compresses having been changed, the formation of the biliary fistula is proceeded with. At about 15 or 20 millimetres from the borders of the incision in the fundus a series of sutures are placed, including only the muscular layer and the peritoneum. The loops of these sutures are brought together, but are not interlocked. The gall bladder is then ready to be stitched in place. A running suture closes the peritoneum above the gall-bladder and then the two ends of each suture are passed through the neighboring parietal peritoneum. When this is done the peritoneum, below the gall-bladder, is closed with a running suture and nothing more remains than to tie each suture in the gall-bladder separately. The top of the gall-bladder which has thus been sutured to the parietal peritoneum projects into the wound, but this projection need not be greater than that necessary to protrude through the rectus muscle.

A buttonhole is made parallel to the fibres of the rectus, at about 5 to 6 millimetres from its external border and through this muscular buttonhole the fundus of the gall-bladder is pulled with a pair of forceps, and then the borders of the opening are united to the anterior aponeurosis of the muscle by interrupted sutures, which should include the entire thickness of the wall of the gall-bladder. Should it be found that the opening into the gall-bladder is unnecessarily large it may be lessened by a few interrupted sutures. A drainage tube which exactly fits the opening in the fundus of the

gall-bladder is then introduced. The closure of the abdominal incision should be done as in any other laparotomy.

The after treatment in this operation is usually simple. After the drainage tube has been removed permanently the fistula is allowed to close itself, a thing which usually takes place within a week or a fortnight afterward. The advantages of this operative procedure appear to me real, because the operation is easily performed. However, the most evident advantage that it presents, according to my way of thinking, is that the fistula closes almost immediately after the drainage tube has been removed. The time at which the tube should be permanently removed will vary considerably according to the condition of the gall-bladder found at operation, but usually the condition presented by the bile will allow one to suppress the drainage anywhere from a fortnight to three weeks afterward.

REPORT OF A CASE OF PARTIAL DISLOCATION OF THE FIFTH LUMBAR VERTEBRA UPON THE SACRUM.¹

BY HENRY O. FEISS, M.D.,

OF CLEVELAND, OHIO.

THE question as to whether dislocation of a lumbar vertebra is possible has been discussed pro and con by many surgeons in the past. At any rate the lesion is considered a rare one, and especially rare when uncomplicated by fracture. Riedinger² has reviewed the subject of dislocation of the lumbar vertebrae quite recently, and himself reports a case of luxation of the fourth lumbar. He states as his belief that one of the chief reasons for its rare recognition is the difficulty in diagnosis. According to him, Baumann in 1894 only had found seven cases. Hirschberg's is the only case since then up to Riedinger's.

The reason for the rare occurrence of the dislocation of the lumbar vertebrae is the mechanism of the joints. The articular facets face laterally, and it would seem from the skeleton that a dislocation could only take place in connection with a fracture of the articular processes. It would also seem from the skeleton that the relative obliquity of the articular facets connecting the fifth lumbar vertebra with the sacrum would predispose to a dislocation at that region as taking place more easily than between any of the other lumbar vertebrae. Although there is this anatomical predisposition, the following case is perhaps the first one of its kind

¹ Presented at the Clinical and Pathological Section of the Academy of Medicine at Cleveland, O., November 3, 1905.

² Archiv f. Orthopaedie, Mechanotherapie und Unfallchirurgie, Band ii., Heft 1.

reported. Even Riedinger in reporting his case is not able positively to rule out a complicating fracture, for he took no Roentgen picture.

A. C., aged twenty years, single, was first seen by me August 16, 1905. He worked in a hotel, running an elevator. Family history and past history are unimportant, and he was perfectly well until nine months ago, when a trunk fell upon him. The trunk fell upon his right side and pinned him firmly against a stair on his left side. After the injury he had severe pain and limped. There was ecchymosis of the right buttock. He limbered up, and later got stiff again. Soon he had to go to bed on account of pain. His legs became swollen and drawn up, the swelling occurring at

FIG. 1



Radiogram of a dislocation of the fifth lumbar vertebra.

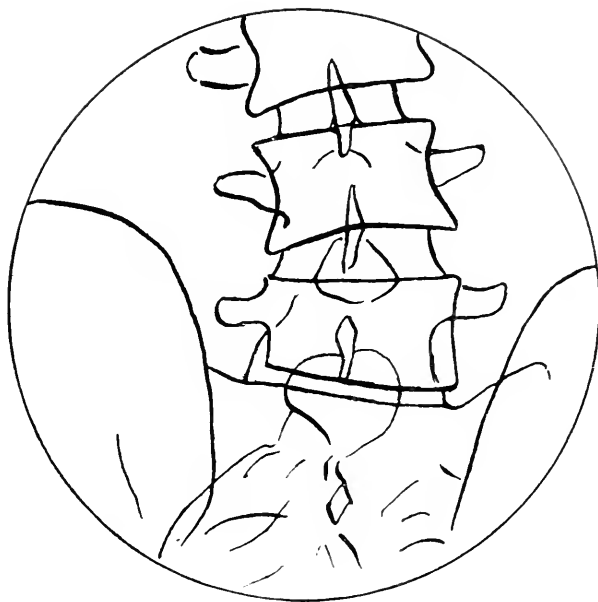
the ankles, calves, and knees. The calves became hard. In April, about five months after the injury, he was again running the elevator, but suffering pain. He was sent to Mt. Clemens for a while, and had returned but only slightly relieved. At the time I first saw him he was troubled chiefly on account of pain and stiffness in his back, and severe pain in the ankles and calves. This pain was worse at night. He was also troubled with numb feelings and paresthesia. He believed his legs were growing thinner. There were no bladder or bowel symptoms. Some cough.

The examination, when first seen, showed a fairly developed young man walking with a crutch. His gait resembled that of a tabetic, although it was not characteristically so. He threw his legs forward

rather forcibly, but landed on the ground gently with his feet. Chest negative. Arms, hands, and shoulders negative. Abdomen negative.

The examination of the spine showed that motions were quite free, except for a slight rigidity in the lowest lumbar region. The hip joints were limited in abduction. The knees showed nothing except a sharp click of the left one on flexion. The feet were in a position of marked valgus, with redness and swelling under the inner ankles, but motions were quite free and there was no spasm—they were cold, clammy, and bluish. There was no evidence of motor paralysis. The sensation to touch was normal. Hot and cold sense seemed unimpaired. Knee-jerks present and normal.

FIG. 2



Tracing of the Roentgen picture.

No clonus. No Babinski. Measured from the umbilicus to the internal malleolus the right leg was $\frac{3}{4}$ of an inch shorter than the left. Both thighs and calves were thin and atrophic, and the perineum was slightly broadened. The spinous processes showed a long left dorsal curve and a slight right lumbar curve. On consideration it seemed wise to take a Roentgen picture of the lumbar region. This picture (Figs. 1 and 2) showed an apparent displacement of the fifth lumbar vertebra $\frac{3}{16}$ of an inch to the right of the middle line, and a compression of the left side of the body of the same vertebra.

The interpretation of such a plate had to be made with great care. There were three hypotheses which might explain this

apparent displacement: first, distortion, due to the fact that the anode of the tube was not exactly over the centre of the picture; second, a dislocation at the sacroiliac synchondrosis; and third, actual dislocation.

To rule out the first we took another picture, placing the tube as nearly as possible over the centre. This second picture confirmed the previous findings. If there was dislocation at the sacroiliac synchondrosis the spine could be twisted with the sacrum, giving an apparent displacement at the region in question, but in taking our picture we pressed firmly upon the patient so that the sacrum was probably flat upon the plate. Moreover, actual measurements from the body of the vertebra to the junction of the crest of the ilium with the sacrum showed that the vertebra in question was $\frac{3}{16}$ of an inch nearer the right junction than the left. Therefore, in all likelihood we have to do with an actual dislocation.

The following day the patient was again seen and the lumbar sacral region was examined. There was no tenderness and no apparent displacement of the spinous processes. This was borne out by the Roentgen findings, for the spinous processes were in a line. The patient said, however, that a great deal of his pain was referred to that region.

A plaster spica was applied from the costal border, including the right hip so as to immobilize the lowest region of the spine. On August 21 the patient said the pain had gone from his back, but that he still had pain in the heels. He continued to improve, and on September 17 a new plaster was applied, including the left hip instead of the right. On October 1 we tried a plaster jacket instead of a spica, but the patient could not wear this. On October 3 we applied a tight canvas belt, with a pad over the sacrum, and ordered Thomas heels for his shoes, that is, a raise of $\frac{1}{4}$ inch on the inside of each heel. October 14, patient improved considerably. He gained altogether eleven pounds since we first saw him, and he continued to improve until October 28, when he came in limping badly on his right foot. Below the right inner ankle there was a fluctuating, swollen, red tumor. A Roentgen picture was taken which showed a spur on the os calcis, accounting for the pain in his foot and his limp. This affection in the heel has nothing to do with the trouble in his spine, and is merely a coincidence.

This is not a case of spondylolisthesis in which a lumbar vertebra is displaced forward, nor does it fall into that group recently reported by Goldthwait,¹ in which there is relaxation of the three pelvic joints, because this is not a relaxation, but rather a fixed malposition in a joint which is not, strictly speaking, a pelvic joint.

An interesting feature is the fact that the vertebra in dislocating shifted the superimposed spinal column so that the upper vertebrae

¹ Boston Medical and Surgical Journal, May, 1905.

moved with it. In other words, the case is more a dislocation of the vertebral column upon the sacrum than of the fifth lumbar vertebra taken by itself.

The fact that the spines are in line shows that the luxating movement has been a rotatory one, the body rotating on the sacrum, at some point near the spinous processes, as the pivot of motion. As to the compression or narrowing of the body on its left side, I believe that this had nothing to do with the initial injury. It is probably due to a new static condition in which the weight bearing has become shifted so that the weight of the superimposed spine comes unequally on the two sides of the body of the vertebra. The same sort of thing is seen in some marked cases of lateral curvature, in which considerable compression may take place. We have already pointed to the fact that there was lateral curvature in this case.

This case shows: first, that at least a partial dislocation of a lumbar vertebra may exist without complication of fracture; second, that it may persist unreduced and yet with improvement in the symptoms; third, that the physical signs may not be sufficient for diagnosis, and that a Roentgen picture is necessary for proof; fourth, there is very likely play in the articular facets, else there would be fracture; fifth, the chief sign of dislocation lay down may be the change in the gait; sixth, that fixation is probably indicated in old unreduced cases.

THE PRACTICAL SIGNIFICANCE OF A TRACE OF ALBUMIN IN THE URINE.

BY JOSEPH P. TUNIS, A.B., M.D.,

MEMBER OF THE COLLEGE OF PHYSICIANS OF PHILADELPHIA, ETC.

THE every-day occurrence of the question of the practical significance of a trace of albumin in the urine makes it of the greatest interest to medical examiners and clinicians, especially when unaccompanied by that other bugbear, "commencing general arteriosclerosis." My experience of the past four years prompts me, therefore: First, to review briefly some of the literature bearing on this subject; second, to epitomize the opinions of a number of representative physicians on certain phases of the subject; and third, to add such conclusions as may be suggested thereby.

By a trace of albumin is meant such a trace of an albuminoid substance as may be detected by the heat and nitric acid test or by Roberts' solution⁴ properly applied—such a trace not to be accompanied by any tube casts of pathological significance *per se* in an otherwise perfectly healthy man. While a vast amount of literature bearing on this subject has appeared in recent years, much yet remains to

be written before anything approaching the final word shall have been said. Chemists may detect a trace of albumin in the urine of perfectly healthy men,⁴¹ while on the other hand careless or improperly trained observers may overlook it when it is obviously present.

Dr. E. W. Dwight, says,⁴¹ "While it is undoubtedly true that in certain cases a report of albumin is made by an inexperienced examiner when it does not really exist, it is my experience that the number is considerably greater where albumin is found on expert examination which has been missed by the average examiner." In the preparation of his admirable paper—"in so far as was practicable the entire medical literature of the subject for the past thirty years has been read, abstracted, and condensed."

He believes: "That the significance of albumin in the urine is purely symptomatic—in other words, that albumin and hyaline casts are a symptom of renal irritation or congestion, not necessarily to any extreme or even considerable degree. Acting on these principles during the past two years the New England Mutual Life Insurance Company has accepted 785 risks of this class, with an expected mortality of 6.8; and but one has died, and "he was blown up by an automobile."

In a critical study of this subject a number of terms are used:

1. *Normal* albuminuria—a nominal trace of albumin which may be found in the urine of all human beings if the tests are applied with sufficient delicacy and frequency.

2. *Spurious* albuminuria—a condition of the urine dependent upon a local inflammation such as urethritis, prostatitis, cystitis, etc., and not, therefore, of renal origin; in brief, "extrarenal."

3. *Physiological* albuminuria (*vide* G. Klemperer¹⁰)—the presence of small quantities of albumin which appear in some persons as a *transient* constituent of the urine after a meal rich in albuminoids, after intense physical strains, after hot baths, and after psychical excitement.

4. Under *functional* albuminuria, J. Dixon Mann²⁸ gives (a) the albuminuria of *adolescents*,² (b) *Cyclic* albuminuria (early morning urine free from albumin, which begins to appear about 10 or 11 o'clock, declines in the afternoon, and by evening has disappeared). Such a condition usually occurs in youth. (c) *Postural* albuminuria and (d) *alimentary* albuminuria. Examples of each are cited. Dr. James Tyson informs me that he has seen examples of each of these conditions, and in a paper read recently in New York,³⁹ he cites the case of a boy in whom the ingestion of a single egg produced marked albuminuria."

Klemperer also says: "The presence of albumin (serum albumin and serum globulin) in the urine indicates a lesion of the renal epithelium. Pronounced persistent albuminuria indicates nephritis."

Other terms, such as accidental,²⁰ dietetic, intermittent,²⁰ ortho-

static,⁴² temporary,³ etc., are also encountered, but I shall confine myself to the so-called *physiological* type more particularly.

Dr. Tyson,³² in a chapter devoted to the history of the development of our knowledge of nephritis, gives due credit to Richard Bright's classical paper of 1827 and adds: "The more recent labors of Bright (*i. e.*, 1831) added much to our information and approached astonishingly our present knowledge." Bostock,¹ in 1827, says that the urine of a perfectly healthy man can show albumin under slight causes. T. Grainger Stewart (1888) says among other conclusions:⁶

"1. There is no sufficient proof that albumin is normally discharged from the human kidneys.

"2. Albuminuria is much more common among presumably healthy people than was formerly supposed, being demonstrated by delicate tests in nearly one-third of those examined.

"3. The existence of albuminuria is not of itself a sufficient ground for the rejection of a proposal for life insurance.

"9. Violent or prolonged exertion often induces albuminuria.

"10. Cold bathing produces or increases it in some individuals."

In order to secure a consensus of present-day opinions a letter was sent to about twenty representative physicians asking the following questions: 1. Is there such a condition as physiological albuminuria? 2. Have you had under your observation any case or cases where a trace of albumin has been present in the urine for ten years or longer in an apparently perfectly healthy man? 3. Do you not think that the mortality among cases showing continuously a trace of albumin is much greater than among an equal number of healthy lives during the same period?

In answer Dr. James M. Anders writes "yes" to all three questions and adds with the latter "many merge into actual renal disease."

Dr. Richard C. Cabot, of Boston, answers "no" to the first two questions and "yes" to the third. In regard to the third question all but two of the answers are affirmative.

Dr. H. M. Christian, in his answer, refers to an abstract of the paper of Wright and Ross⁴³ as expressing his views on the subject.

Dr. Judson Daland writes: "Albumin as determined clinically by heat and nitric acid, in my experience, has always been pathological. I have seen cases where a trace of albumin was intermittently present in the urine for a period of ten years or thereabouts in an apparently healthy individual. Certain of these cases passed from my observation so that I do not know their history. In one instance, however, the patient died of uremia fifteen years after the first appearance of albumin."

Dr. H. A. Hare says: "I do not believe there is *physiological* albuminuria except in those instances where an excess of albumin has been ingested. I, however, believe that there can be albuminuria without nephritis, and this class of cases would probably come under that commonly applied misnomer "physiological albuminuria."

In regard to question 2, I have had a number of cases in which albuminuria lasted for many years without apparent ill-effect, but in the end they all succumbed to chronic contracted kidney."

Dr. Morris J. Lewis says: "1. I believe there is a physiological albuminuria, although I hesitate to make this diagnosis unless all other investigations fail. My personal experience seems to uphold this view. 2. One patient of mine, when a girl (1892), had pronounced albuminuria after dancing, from a trace up to 50 per cent. by bulk, and *none the next day*. This was repeatedly verified during ensuing years. She subsequently married, had three normal labors, and died one year ago of an acute infection, with a good pair of kidneys. Was this physiological albuminuria?"

Dr. J. H. Musser, in reply to question 1, writes: "An albuminuria exists not incompatible with good health." He answers question 2 in the affirmative. In reply to question 3, "I cannot say."

Dr. J. A. Scott, answers all three question by "yes," and in replying to the second, says, "Not more than two, for the simple reason that we lose sight of these men after a certain length of time and cannot, therefore, state that they are now in perfect health."

Dr. F. C. Shattuck, of Boston, answers question 1 by "I think not" and 2 by "yes, several." He declines to answer (3) without consulting his records, which would take too long.

Dr. Wharton Sinkler writes: "Question 1, I am unable to answer. Question 2, I have had a number of patients under my care where there has been a trace of albumin in the urine for more than ten years in an otherwise apparently healthy man. I have seen other cases in which a trace of albumin was present for a number of years in individuals who were in fairly good health, but evidently had nephritis, and who lived for many years, to die of an intercurrent disease. Question 3. I have not sufficient data to answer accurately, but my judgment would be that the mortality among cases showing continuously a trace of albumin would certainly be greater than in persons not exhibiting this symptom."

Dr. Alfred Stengel says: "I doubt the existence of a physiological albuminuria in the strict sense. No doubt traces of a proteid substance may be quite common in the urine in practically healthy persons. (2) I have treated several cases in whom there was almost constantly a trace of albumin for ten or twelve years, and I know of a number in whom the records previous to the time of my treatment indicate the existence of traces of albumin from time to time during even a longer period. (3) I believe that the constant presence of a trace of albumin indicates a much more serious condition of things than occasional traces. I would not presume to express a positive opinion based upon the presence of a trace of albumin without reference to the clinical conditions as a whole."

Dr. James Tyson answers "no" to the first question and "yes" to the second. In reply to the third, he says that he has no reason to believe so if the albuminuria is unaccompanied by other signs of Bright's disease.

Dr. J. C. Wilson writes: "1. I am not disposed to regard the transient albuminuria which occurs after excessive fatigue, forced marches, and under other conditions not clearly defined, especially in adolescents and young adults, as physiological. This is, however, a question of terms. 2. I have had a number of men under observation in whom in the absence of clinical evidences of substantive disease of the kidneys there has been occasionally found albumin in the urine usually coincident with some trifling illness. I do not often have the opportunity of examining the urine of people who regard themselves as perfectly healthy."

Dr. Robert N. Willson says "yes," if by this is meant a temporary albuminuria, the expression of a temporary embarrassment of the kidneys, as from violent exercise, etc.; "no," if one means albuminuria in the absence of such a temporary embarrassment. To question 2, he answers "no," and to question 3, "I am sure of it. I have, moreover, come to the conclusion that every trace of albumin found constantly in the urine has a pathological cause."

Dr. William R. Bross, Medical Director of the Equitable Life Assurance Society, writes: "My personal experience, covering a number of years, with a vast amount of material from which to judge, is that albumin in the urine of an apparently healthy individual is of pathological significance. I do not mean to imply that I consider it an evidence of Bright's disease, but it is an evidence that something is wrong, and if we cannot determine the cause it is due to our lack of diagnostic ability. I will admit without argument that many albuminurias are transient, but up to the present time we have been unable to determine when a case came before us just which road it would travel. In the insurance world we have no opportunity of studying these conditions, as the clinical physician has, and are only familiar with the results, and even these are meagre."

Dr. E. W. Dwight, Medical Director of the New England Mutual Life Insurance Company, objects strongly to the use of the term physiological albuminuria. He answers "yes" to question 2.

Dr. C. H. Harbaugh answers "no" to the first question and in reply to question 2 says: "I examined a man last week who was rejected for albuminuria in 1892, 1898, 1903, and last week when he still had albumin. This man is thirty years of age, a bookkeeper, married, seventy-five pounds over normal weight, and to all appearances in the best of health."

Dr. Oscar H. Rogers, Medical Director of the New York Life Insurance Company, writes "no" to the first question; in reply to the second he says, "Not under continuous observation, but

many cases which have been observed at infrequent intervals over a period of ten or more years."

Dr. Oliver P. Rex, Medical Director of the Penn Mutual Life Insurance Company, answers "no" to questions 1 and 2; in reply to question 3 he says, "We do not think that the mortality among cases showing continuously a trace of albumin is much greater than among an equal number of healthy lives during the same period."

Dr. J. F. Stone, Chief Medical Examiner for the New York Life Insurance Company in Philadelphia, writes: "1. 'This is largely a question of definition. If you mean by albuminuria a condition of the urine where albumin is present in easily recognized quantities by an ordinary test, my answer would be that there is no such condition as "physiological albuminuria." If you define albuminuria as the presence of albumin in any quantity—however minute in the urine—then I believe there is such a condition as physiological albuminuria. 2. I have several such cases, and one especially which has been under my observation for twenty-seven years, with general health absolutely unaffected."

Dr. L. C. Stillings, of the same Company, answers "no" to the first question, and "yes" to the second; adding, "My experience, however, with these cases is that in time if the condition is renal they break down." His deductions are drawn from approximately fifteen thousand examinations for insurance.

Dr. Charles H. Willits, Medical Director of the Provident Life and Trust Company, answers "no" to the first question and "yes" to the second. He also answers "yes" to the third question adding "Although I do not think the mortality is always excessive."

Personally, I do not believe that the term physiological albuminuria is a good one; certainly not from a medical examiner's point of view. The term *transient* albuminuria would seem a preferable term, meaning by that a condition of the urine due to increased blood pressure brought about temporarily. In reply to question 2, I recall the case of a physician of this city, aged forty-three years, whom I have repeatedly examined for life insurance. For fifteen years he has had a trace of albumin in the urine following an attack of typhoid fever during convalescence from which cystitis developed. This condition of the bladder was probably due to the improper use of a catheter. He has always received graded policies as the result of this albuminuria. He has every appearance of perfect health and is an active practitioner. It is quite probable in this case that there has been a slight resulting irritation of the prostate gland as a sequel to his cystitis, sufficient to account for the albumin. There have been no casts of sufficient importance to throw any additional light on the condition of his kidneys. During the four years that he has been under my observation there is not the slightest deterioration in his health. What examiner, however, would be bold enough to make such a statement to his medical director and suggest that

such a case be given a standard form of life insurance? In this connection it is interesting to note the paper of Edgar G. Ballenger⁴⁰ on "*Prostatic Albuminuria*." In his conclusion this writer states: "1. The secretion from an hyperæmic or an inflamed prostate is albuminous, while that from the normal gland is not." "In making insurance examinations, as well as in the diagnosis of obscure forms of albuminuria, this possibility should be eliminated with the other sources of contamination before reaching a positive conclusion as to the significance of albumin."

Dr. Stengel³⁶ in a recent paper says: "The kidney is excessively prone to slight and transient alterations which in all probability will undergo satisfactory resolution without permanent impairment of the integrity of the organ. . . . I do not wish to convey the wrong impression that I estimate lightly the importance of urinary examination; far from it. But I know from much experience that a trace of albumin is too often magnified in importance in the physician's mind, and that the clinical conditions as a whole are not sufficiently considered."

Dr. W. B. Vanderpoel, Medical Director of the New York Life Insurance Company, is quoted in an editorial²¹ for March, 1903, as saying that the mortality of cases refused life insurance during the past fifteen or twenty years for albumin is *four or five* times greater than among an equal number of healthy lives during the same period. This group must necessarily have included a large proportion of cases in which other evidences of poor health were present at the time of examination. Corroborating this Dr. N. S. Davis, Jr., of Chicago (1902), has watched many of these cases declined by life insurance examiners and "little by little a chronic diffuse nephritis develops."¹⁹ In this connection is it not of some comfort to the often harshly criticised medical examiner to reflect that by calling attention to an unsuspected trace of albumin many useful lives have been considerably prolonged?¹⁴

It will be admitted without argument that tube casts of pathological significance may be found in some specimens of urine in which no trace of albumin has been detected by the tests herein mentioned, even in skilled hands. In other words casts may be present without albumin.²² Furthermore, experience proves that "a faint trace of albumin" in the urine of an apparently healthy man often leads to the detection of tube casts of real prognostic significance.

Wright and Ross,³⁸ in a paper on "The Discrimination of Physiological Albuminuria from that Caused by Renal Disease," cite seven cases and suggest the possibility of so discriminating by the exhibition of calcium salts. They recommend that doses of from forty to sixty grains of calcium lactate be given "to increase the coagulability of the blood." They claim that the use of this drug increases the amount of albumin present in the urine in true nephritic cases very considerably, while it has no effect whatsoever on the normal kidney.

Considerable experience with this drug in the hands of several observers will be necessary before any conclusions of real value can be reached. It seems, however, a practical suggestion that in cases of doubt this harmless drug should be employed to determine whether the trace of albumin is only a transient constituent of the urine. Similarly the use of four ounces of syrup (or 100 grams of sugar) in soda-water and an examination of the urine two hours afterward may be employed to determine whether diabetes exists in a suspected case.

C. E. Simon,⁸ in his *Clinical Diagnosis*, writes, "It may safely be said that a transitory, intermittent, and cyclic albuminuria is not infrequently observed in apparently healthy individuals, but that the facts so far brought forward do not warrant the assumption that such forms of albuminuria are physiological."

A. Oswald,²⁹ writing in 1904, does not think there is such a condition as physiological albuminuria. He believes that it is the result of an injury to the renal epithelium, and it must therefore be considered at least transiently pathological.

A. C. Croftan³⁰ disapproves strongly of the term physiological.

Dr. William Osler, in an article with the startling title "On the Advantages of a Trace of Albumin and a Few Tube Casts in the Urine of Certain Men above Fifty Years of Age,"¹⁴ mentions three cases which were refused additional life insurance on account of a trace of albumin and a few hyaline casts. These cases were subsequently under observation from eight to ten years or longer. All three enjoyed vigorous health from fifty-five to sixty-five years of age or longer. He believes that in men of fifty or sixty years of age, albuminuria is by no means infrequent and is not always serious. Dr. Osler called attention in this article to three indications pointing to serious disease: (1) persistent low specific gravity of the urine from 1008 to 1012; (2) the state of the heart and arteries; (3) the presence of albuminuric retinitis. In conclusion he says: "Let me not be misunderstood: a trace of albumin and a few tube casts are danger signals, the red lights which may mean an open drawbridge or a wrecked road ahead; but they may be simply warnings to the engineer to 'go slow,' that the pace is too rapid for the state of the track."

When the heat and nitric acid test is properly applied with a suitable background for observing the heated portion carefully there can be no better test for all practical purposes. It is well, however, to have another control³⁷ test at hand when there is any possibility of doubt in the mind of the examiner. For this purpose Roberts' solution,⁴ consisting of one part of nitric acid to five parts of a saturated aqueous solution of magnesium sulphate, is of great use, especially when employed in the horismascope or some similarly arranged tube. Especial care should be used in employing the latter test that the urine and the solution should not remain in contact for more than two minutes. Any faint reaction which appears at the

point of contact after two minutes have elapsed may be ignored. The advantages of using Roberts' solution are: 1. That the albumin ring appears as a distinct white line at the point of contact, the presence of the sulphate of magnesium preventing the brownish ring which is so frequently present in Heller's test. 2. It enables a rough distinction to be made between mucus and albumin, the former appearing as a diffuse cloud *above* the point of contact. This distinction is of particular value in the examination of women. 3. When the specimen is of small volume the horismascope²⁶ often enables one to make a thorough examination for albumin when the quantity would not have been sufficient for the heat and nitric acid test. 4. Serum globulin is thrown down by this test better than by the heat and nitric acid. 5. The apparatus required is exceedingly simple. The delicacy of this test is equivalent to that of the heat and nitric acid test. It will show one-hundredth of one per cent. of albumin very clearly—or "a trace"—up to the two-thousandth of one per cent.—or "a faint trace"—beyond which it is not necessary to go.

CONCLUSIONS. 1. From any point of view the term "physiological albuminuria" is almost universally regarded as misleading, unsatisfactory, and inadequate.

2. As long as albumin is a constituent of the urine the individual voiding it cannot be regarded as normal.

3. The mortality among such persons must necessarily be higher than among an equal number of individuals who do not show this phenomenon.

4. The actual mortality rate among this class can best be approximated by a comparison of the records of half a dozen of the largest life insurance companies (dealing with hundreds of thousands of cases) over a period of twenty years at the least.

5. The prompt means of discriminating between the transient forms of albuminuria and those of real clinical significance may be found in some such therapeutic test as that of calcium lactate rather than by any further developments in the chemistry of the urine.

6. Experience proves that "a faint trace of albumin" in the urine of an individual past middle life is often of greater significance than "a decided trace" by unexpectedly directing attention to the finding of casts of pathological importance, which might otherwise have been easily overlooked.

7. For practical purposes the heat and nitric acid test for albumin is the best one, and the careful use of Roberts' solution the most satisfactory control test in doubtful cases.

8. For the proper diagnosis and prognosis too much stress cannot be laid on a thorough consideration of the clinical conditions as a whole.

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ALCOHOLIC MULTIPLE NEURITIS.¹

BY CHARLES W. BURR, M.D.,

PROFESSOR OF MENTAL DISEASES, UNIVERSITY OF PENNSYLVANIA; NEUROLOGIST TO THE
PHILADELPHIA GENERAL HOSPITAL.

MULTIPLE neuritis is as a rule easily diagnosed. Its differentiation from cerebral palsy is never difficult, but sometimes it is almost impossible to determine whether or not there is also disease of the spinal cord. In children the question may arise whether acute anterior poliomyelitis or neuritis is present. In both there is a flaccid palsy, with muscular wasting, changes in the electrical reactions of the muscles and loss of the deep reflexes, but in the former there is never muscle pain, nerve tenderness, nor areas of skin anæsthesia. In acute transverse myelitis anæsthesia extends to a well-defined boundary on the trunk and is not limited to the distribution of certain cutaneous nerves; there is not marked pain, the bladder and rectum are always affected, and bed-sores are common. The difficult cases are those in which multiple neuritis being admitted the question is, Is the cord involved. The surest sign of such involvement is incontinence of the bladder and rectum. Pseudo-incontinence may result from lack of attention on the patient's part from delirium, stupor, or dementia, but true incontinence almost surely proves spinal cord disease. Very rarely neuritis of the pelvic nerves may cause it. Slight changes in the spinal cord are common in cases of neuritis in which the inflammation has not been confined to the peripheral distribution of the nerves but has extended upward. Such changes, however, do not cause any new symptoms. On theoretic grounds several authors maintain that at the beginning of a

¹ Read at the meeting of the Philadelphia County Medical Society, March 14, 1906.

neuritis the deep reflexes are always increased, the argument being that in all inflammatory processes excessive irritability precedes decrease or loss of function. This is certainly true of inflammation affecting nerve cells unless it is so severe and sudden as to cause immediate destruction of the cells, but it is doubtful if it is the case in inflammation of motor nerve fibres. It is much more likely that in all cases in which the knee jerks are increased the spinal cord is diseased, or the sensory nerves are so much more affected than the motor that the pain reinforces the reflex. Certainly, when the knee jerk is spastic, *i. e.*, not merely larger in amplitude but quick in response, rapid in movement, and associated with an increase in muscle-tone, disease of the cord exists. Symmetrical distal, without proximal, palsy of the arms or legs, or both, is always neuritic.

Much more difficult than the recognition of the seat of disease is the determination of its cause. The diffusible stimulants, acute infectious fevers, especially typhoid, several metallic poisons, and some chronic diseases all cause multiple neuritis. Some cases must still be called idiopathic. In such, the symptoms come on acutely and in the absence of any known cause. Such cases are due to an intoxication affecting the peripheral nerves primarily, but whether the poison arises within or without the body is unknown.

In only a few types of multiple neuritis, *e. g.*, diphtheritic neuritis, are the symptoms distinctive enough to enable a diagnosis to be made from them alone. Often the history of the work and habits of the patient must be known to form a correct opinion. Sometimes more than one cause has been or may have been operative, *e. g.*, lead and alcohol, childbirth and alcohol, some acute fever and alcohol. Owing to the widespread use of alcohol and the frequent impossibility of discovering how much it has been abused there is a tendency to assume it is the cause when it has not been a factor.

There are two distinct types of alcoholic multiple neuritis, the one chronic throughout its course, slow in onset, slow in its progress and lasting it may be for many years, the other distinctly acute but preceded by a longer or shorter period of prodromal symptoms. Many of the acute cases are engrafted upon the chronic disease. The factors that cause one man to have chronic neuritis and another an acute outburst are unknown.

Slight or not very severe neuritis is very common in middle aged drunkards. Sometimes the only symptoms are muscle pain and nerve tenderness in the legs and cramps at night. The pain may be a mere dull ache, localized soreness, or sharp and shooting. Frequently there is in addition to pain some weakness in walking, a slight paresis, more rarely distinct but not complete palsy, especially of the anterior tibial muscles, causing foot-drop and steppage gait. The knee jerks are decreased and later absent. Some patients have a pseudo-ataxic gait. They always present the general symptoms of chronic alcoholism. The disease is sometimes mistaken for

locomotor ataxia. The gastric attacks of alcoholic gastritis may simulate the crises of locomotor ataxia. Paræsthesia of the legs and feet are not uncommon, the patient complaining of numbness in the feet, more rarely in the hands, a feeling as of ants crawling on or under the skin, localized sensations of heat and cold in the feet or legs, and even the sensation of walking on thick carpet. Areas of tactile anæsthesia are present in the legs. On the other hand, Argyll-Robertson pupil is never caused by alcohol alone. It should be remembered, however, that in and after middle life the pupils are normally a little small and the irides distinctly less prompt and with a smaller amplitude of movement in responding to light. Forgetfulness of this sometimes causes erroneous conclusions to be drawn. Again, alcoholism never produces rectal, vesical, or other true crises. There may be slight muscular wasting in the legs, but trophic changes in the joints never occur. The gait may simulate ataxia. The symptoms may remain stationary for a long period, even years, and are often greatly improved by abstinence and medical treatment. Some of the cases of alleged locomotor ataxia cured by various measures are really cases of chronic alcoholic neuritis.

The following (Case I) is a fair example of the milder type: A. B., a white man, aged forty-five years, was admitted to the Philadelphia Hospital complaining of shooting pains in the legs and abdomen. The pains began about five years before his admission and for a long time had been so severe as to disturb sleep. Frequently also he had painful cramps in the calves after going to bed. He never had any real cramps in the hands, but they often felt "drawn up and stiff." He had no trouble in walking except from pain.

Examination. He was a well-built, well-nourished man, who walked well but swayed slightly on standing with the eyes closed. There was neither palsy nor ataxia of the arms. The knee jerks were very feeble, the triceps and biceps jerks were plainly present. The pupils reacted sluggishly to light and with accommodation. All ocular movements were normal. Tactile sensibility was no mal everywhere. The nerves and muscles of the legs were painful. After three months the pain and tenderness had entirely gone and the knee jerks became normal.

Cases like this are more frequent than hospital statistics indicate. Many patients never become ill enough to go to a hospital. Many who come to such hospitals as Blockley show the influence of exposure and bad or little food in suddenly increasing the severity of the symptoms. After they have been in the hospital a few days they begin to improve and a patient who looked seriously ill, after a few months, largely recovers.

Acute multiple neuritis is much more important than the chronic type. It is very doubtful if it ever occurs as long as the digestive processes are carried on normally. It is extremely rare among young drunkards, and seems to require disease of the stomach and

liver for its development. It is most likely not a direct poisoning of the nerves by alcohol, but the alcohol probably so alters the chemical processes of digestion as to produce poisons within the body which in turn act upon the nerves. The curve of the age liability to the disease is very interesting. Below twenty years it is almost zero, from then till the thirtieth year there is a rather rapid rise which becomes almost abrupt in the early part of the next decade, sinks rather slowly to the fiftieth year, and then falls abruptly. After sixty years the disease is a rarity. The cause of this fall is of course not that age gives immunity but that most drunkards die before the sixtieth year. The view one time held by some writers that beer never causes neuritis has been proved to be an error, but whiskey drinkers fall victims more surely than beer drinkers. Periodic drinkers who abstain between times run much less risk than the man who is never drunk but takes a little too much every day. How much alcohol must be taken to produce neuritis is a variable quantity depending upon inheritance, the man's mental, emotional, and physical make up, and the amount and kind of work he does. The influence which station in life exerts is very difficult to determine. More laboring men suffer than any other class but they make up the large bulk of the community. A very large percentage of them use alcohol and many suffer from exposure and bad food. The greater percentage, though the absolute number is much smaller, of cases probably occurs in people who do little or no physical work. In other words, a man who does physical work or who takes much exercise probably can drink a larger amount without harm than the man who does neither. Statistics on the influence of sex vary. In my own experience women have much outnumbered men. I believe they are more liable to the disease.

Though the severe stage of the disease is acute, or at least subacute in onset, there is always a longer or shorter prodromal period characterized by slight muscular pain, nerve tenderness, paresthesia and muscular cramp usually affecting the calves at night and very rarely appearing in the forearms. As a rule, too, there are marked symptoms of digestive trouble, a coated tongue and foul breath, anorexia, constipation, and even vomiting. Sometimes the attack follows immediately after or begins during delirium tremens. After the prodromal stage there is a sudden or rapid increase in the symptoms. The muscle and nerve-trunk pain becomes intense, and the skin, especially on the soles and palms, so hyperæsthetic that mere contact causes agony. Peripheral palsy of the legs, less frequently of the arms and involving principally the extensor muscles, causing foot- and wrist-drop, comes on. The palsy may become so extensive and severe that all power of movement of the limbs is lost. The deep reflexes are abolished. The palsied muscles become soft and later waste, and the electrical reactions change quantitatively. Typical reaction of degeneration occurs. The palms and soles

sweat profusely. The nerve trunks are exquisitely tender and may be palpably swollen. Slight fever may be a part of the disease but hyperpyrexia proves some complication. The skin especially of the legs undergoes trophic changes, becoming smooth, hairless, glossy and thin. The toe nails grow less quickly and become ridged, roughened, brittle, and thickened. The return of normal growth at the root of the nail is a good sign. In uncomplicated cases the bladder and rectum remain under good voluntary control. Some patients suffer cranial nerve palsy, but it is more than possible that such cases are mixed, *i. e.*, something more than alcoholic neuritis is present.

Almost every case of acute alcoholic neuritis presents some mental symptoms. Sometimes there is only a little confusion with marked emotionalism, or a distinctly hysteroid state, but not infrequently there is the picture described by Korsakoff in 1887. Since his paper was published a great deal of attention has been given to the matter. The cardinal symptoms are loss of memory, confusion, and fabrication. A typical case begins with delirious excitement. Mental confusion is very great. Memory for recent events is always bad but the power of recollecting occurrences of early life may be fairly well preserved. Fabrication, believing in and relating events that never occurred, is characteristic. The patient may quietly and with absolute certainty of belief say that he has done things which never happened. Imagination is increased and is uncontrolled by reason. The patient may say he went out driving yesterday or was visited by an old friend to-day when really he has been bedridden for weeks and has had no visitors. He may imagine the doctor and nurse are old friends. Visual and auditory hallucinations are frequent in some cases, absent in others. A woman long past the menopause sees her newborn baby in bed with her and fondles and nurses and talks to it. No attention is given to the surroundings, and a patient in a large hospital ward filled with patients may think he is at home, or if at home may not recognize his own room and think he is in a strange place. Even when the mental confusion is very great he may be able to answer a few simple questions intelligently, but he soon passes again into his own inner world. Time has no meaning to him and the facts and fancies of to-day are mixed up with the things of years ago. At the beginning the emotional state is one of anxiety, but later the patient becomes peevish and even quarrelsome, or grandiose or sillily happy. These mental symptoms may precede, accompany, or follow the onset of the physical signs of disease, but they never begin after convalescence. The duration may be long or short, and improvement, once started, may come on rapidly within a day or two or slowly, extending over many days or weeks. It is usual to call this complex of symptoms Korsakoff's psychosis, but many years ago, in 1791, Lettsom published the sixth edition of a little pamphlet entitled *History of Some of the Effects of Hard*

Drinking, in which the essential symptoms are clearly, briefly, and accurately described. His words are "they talk freely in the intervals of mitigation, but of things that do not exist; they describe the presence of these friends as if they saw realities, and reason tolerably clear from false premises." Though this complex of symptoms is common in alcoholic neuritis it is seen in other conditions. It occurs in alcoholism without neuritis, in neuritis from other causes, is an occasional incident in cerebral syphilis and cerebral trauma, and may be an event in the beginning stage of senile dementia. Unlike Korsakoff, Lettsom knew of its occurrence only in alcoholic palsy.

The prognosis in multiple neuritis without serious mental symptoms is as a rule good. The patient may die in the acute stage from cardiac palsy or exhaustion or some complicating infection, or he may survive with only slight mental impairment and a little foot-drop. Sometimes recovery is complete, but as a rule, if marked mental symptoms have been present, the edge is taken off the mind and the man previously mentally alert is left slow, dull witted, indolent, with somewhat defective power of attention and lessened capacity for work. Sometimes he survives with marked permanent dementia rendering him wholly unable to care for himself for the remainder of his life. The occurrence of marked mental symptoms increases the danger to life.

The following history (Case II) is a good example of the difficulty sometimes met with in discovering the cause. The patient, an Italian laborer, aged thirty-three years, was brought to the Philadelphia Hospital in November, 1905, complaining of "inability to walk and heaviness in the arms and legs." He was only a moderate drinker. He gave no history and showed no signs of syphilis. He had been, according to his own account, treated at the Pennsylvania Hospital in September last for typhoid fever. I have been permitted to see the records of his case there, and they negative that diagnosis. The notes state he was admitted on October 5th, with a temperature of 102°, pulse rate of 96, and respiration rate of 20. He had been ill about six days. The illness came on with vertigo, vomiting, and pain in the region of the liver. The only physical signs present indicated acute bronchitis. The temperature rapidly fell to normal, all symptoms passed away, and in nine days he was well. The Widal reaction was negative. While at the Pennsylvania Hospital he showed no signs of any palsy. He told us that a few days after leaving the hospital he returned to work, but within a week became ill again. He was sick at the stomach and his muscles were sore and weak. In a few days he became bedridden. The arms and legs were never very painful, only somewhat sore and tender on pressure. There was no disturbance of bladder and rectal control.

Examination. He was a clear-eyed, clean-skinned young man, presenting none of the signs of alcoholism. There was double

wrist- and foot-drop. The grip was poor. He could weakly flex and extend the forearms and by a throwing effort get his hands above his head, but he could not feed himself. He could slightly flex and extend the knees in bed, but not walk or even stand. The arms and legs were soft and flabby, but there was (on admission) no distinct local wasting. Sensibility was normal over the entire body. The cranial nerves were normal. The pupils, equal in size, responded quickly and well to light and with accommodation. The knee, biceps and triceps jerks and the plantar and cremasteric reflexes were absent. The muscles were not painful but the calves were tender when squeezed. Nerve-trunk tenderness was slight. He controlled the bladder and rectum well. His mental state, so far as could be determined in a man who talked only a little English, was good. He certainly had no marked mental disturbance, as he talked rationally and his behavior was entirely sane. He showed none of the signs of delirium or dementia. The heart and lungs were normal. By the 19th of December the muscles were much wasted, especially the extensors of the hands and feet and the intrinsic muscles of the hands. Now (February 14th) his condition remains the same. Because of the absence of all of the general signs of alcoholism and the almost purely motor type of the symptoms I do not believe he has alcoholic neuritis. It is much more probably a case of so-called idiopathic neuritis or the bronchitis may have been influenzal and the neuritis a consequence of it.

The next patient (Case III) is an example of combined nervous syphilis and alcoholic neuritis. B. D., a white woman, aged thirty years, was admitted to the hospital in February, 1904, complaining of inability to walk. She had been a heavy drinker for years and was on a spree for a month before the onset of her present illness. Almost two months before admission she awoke one morning with extreme pain in both legs and such weakness in them that she could not get out of bed. Some incontinence of the bladder and rectum appeared and her hands became weak and felt numb and dead.

Examination. She looked like an old alcoholic. Both feet dropped and the palsy of the legs was so great that she could scarcely move them. There was no wrist-drop nor indeed any marked palsy of the arms, but all movements were weak and the grip was very poor. The calves and the nerves at the knee were tender. The soles and palms hurt all the time. Notwithstanding the subjective pain and the hypersensibility to deep pressure there was insensibility to mere touch over the legs and lower part of the abdomen. There were two quite deep bed-sores on the buttocks and another on one hip. The knee and Achilles jerks were absent. She had to empty the bladder and rectum as soon as the impulse arose. The pupils were sometimes equal, at others unequal. The reaction of the irides varied. Their movements were always sluggish, but sometimes they reacted to light and not with accommodation, while at other times the reverse

occurred. Sometimes they reacted a little in response to both light and accommodation. She was a dull stupid woman of low mentality, but not insane or delirious. By March, 1904, the bed-sores had healed, the tactile anæsthesia was lessened, or rather was present only in a few scattered areas, and slight power of movement of the legs had returned. By December, 1904, she could barely go through the movements of walking when supported on both sides, the toes scraping the floor. When seated she could raise the thighs, flex and extend the knees, and move the feet a little. After sitting for a short while the feet became blue and cold and a little puffed. The arms were fairly strong and the biceps and triceps jerks were present. The plantar jerks were variable, stroking the soles sometimes causing flexion, sometimes slight extension of the toes. The variability of movement depended on the intensity of the stimulus and not on the part of the sole stroked. Bladder and rectal control had improved somewhat. By January, 1905, she could sew, could get out of a chair and stand with very little aid, but could not walk unsupported. She could move the toes and flex and extend the ankles. Sensibility was normal over the entire body. She controlled the bladder and rectum quite well but it was still impossible to hold the urine for a long time. She has now (February 1, 1906) been at a standstill for several months. There is marked foot-drop and on account of the pulling up of the Achilles tendon the heel is fixed. When supported by one hand she stands with the toes on the floor, the heels in the air. She cannot put the heels to the ground. When supported by both hands she can take a few steps on her tiptoes. There are slight contractures of the knees. Barring slight hyperæsthesia of the soles there are no sensory disturbances. All the deep reflexes of the legs are absent. The arms are normal in all respects. Bladder and rectal control is good.

The mode of onset, the complete palsy of the legs, the bed-sores, the incontinence of urine and feces, and the tactile anæsthesia not affecting the distribution of certain cutaneous nerves, but extending to a line on the abdomen, all indicate disease of the spinal cord. The muscle pain, the tenderness of the nerve trunks in their peripheral distribution, and the sensory symptoms in the arms, with but little muscular weakness, indicate multiple neuritis. The case is, of course, not an ordinary syphilitic meningitis, and I think the correct diagnosis is combined alcoholic and syphilitic disease. Cases of alleged acute syphilitic multiple neuritis have been reported, but it is so well established that the primary seat of infection of the nervous system is the pia of the brain and cord that, given a syphilitic with multiple neuritis, it is well to look farther for its cause.

The next case (Case IV) occurred in an alcoholic woman after childbirth. Whether the neuritis was entirely alcoholic or whether puerperal sepsis was also causative cannot be determined. The patient, aged thirty-five years, was admitted to the Hospital in

September, 1905, complaining of inability to walk and pains all over the body. She dated her illness from April, 1905, at which time she miscarried a six months' foetus. During the latter part of her pregnancy she felt ill and tired all the time, but with no well-defined symptoms. Two weeks after the miscarriage she rapidly grew worse and was seized with severe cramps and pains in the legs. They and the arms also felt stiff. She stopped walking about a month later.

Examination. She was a poorly nourished, middle-aged woman. She could not stand and both feet dropped. Even when in bed she could scarcely move the legs. The wrists dropped slightly and all movements of the arms were weak. The bladder and rectum were well controlled. The calves were painful and the nerve trunks from the knees down were very tender. The hands were numb. The calves, hands, and extensors of the wrists were much wasted. The knee, Achilles, biceps, and triceps jerks were absent. There was no disturbance of function of the cranial nerves except that the pupils reacted sluggishly. The lungs were normal. The heart sounds were weak, but there was neither valvular disease nor hypertrophy. By the middle of October she was able to use the hands well and numbness had much decreased. Pain and hyperæsthesia continued in the legs. The soles were especially sensitive. Now (January 26, 1906) she can flex and extend the knees in bed, lift the legs an inch or so from the mattress, and abduct and adduct the thighs slightly. Foot-drop persists. Both great toes drop. The proximal phalanges of the other toes are extended and the distal flexed. She uses the arms well. The soles are still very sensitive. There are no sensory disturbances in the arms. The deep reflexes are still absent. Her mental state at the beginning of the illness is unknown but since she has come under observation it has been normal. She states that her memory is not as good as formerly, but she remembers well the daily events in the ward.

In Case V a local pressure palsy occurred, at the time of onset of the general neuritis, and the knee jerks were preserved throughout the entire illness. The patient was a woman, aged thirty-three years, who had suffered much, sinned much, and drank much. She was brought to the hospital in January, 1905. She stated that early in the month she had begun to feel sick, had headache, fever and chills, stiffness in the joints, cramps in the calves at night, and pain in the feet and hands. She took even more whiskey than usual, and while she was stupid from liquor her husband lay for several hours on her right arm. Next morning she could not get out of bed because her legs were too weak and painful, and could not use the right arm, which was swollen.

Examination. She was a fat, flabby woman with an alcoholic face. The feet dropped. She could weakly move the legs in bed but could not stand. She weakly flexed and extended the right

forearm, but could not hold the arm up unsupported. She could not extend the wrist beyond the plane of the forearm and could not further flex the already partly (paralytically) flexed fingers. The hand and arm were somewhat swollen and pitted on pressure. Examination of the axilla revealed no cause for vascular obstruction. She could move the left arm freely, but weakly, in all directions. There was marked loss of power in extending the wrist against resistance. The grip was poor. The biceps jerk was absent on the right and present on the left side. The little finger of the left hand and the adjacent side of the ring finger as well as the ulnar side of the palm and the back of the right hand were anæsthetic to touch and temperature. There was no anæsthesia in the legs, but some pain and, on pressure, tenderness. The right leg and foot were somewhat swollen and pitted on pressure. There was never œdema on the left side. The cranial nerves were unaffected. The knee jerks were increased in amplitude but not spastic. Ankle clonus was not present. The plantar jerks were normal. The Achilles jerks were present. The right pupil was larger than the left, and when exposed to light contracted slightly and then dilated. The left reacted normally to light and both with accommodation. Throughout her illness she retained control of the bladder and rectum. She had chronic nephritis. In the middle of March she was discharged practically cured, but though the right grip was strong, flexion of the fingers of the left hand was weak and tactile anæsthesia of the ulnar distribution of the left hand persisted.

Case VI shows the influence of pneumonia in causing a recrudescence of pain and palsy. The patient, a woman, aged thirty-six years, was brought to the Hospital in June, 1905, complaining of pain and swelling of the feet and legs and shortness of breath. She had been a heavy drinker for years, and during the last eight had had occasional epileptic attacks. She became ill about three weeks before coming to the hospital.

Examination. Her face was pallid and bloated and the legs œdematous. She could not stand alone. Sensibility to pain was lost in the left foot and thigh and in the entire right leg. The left calf was less sensitive to pain than normal. She complained of prickly sensations in both legs below the knee. Sensibility to temperature was lost in the right foot. The knee, Achilles, and plantar jerks were absent. The popliteal spaces were very tender to pressure and the calves hurt continuously. The pupils were equal and reacted well. The lungs were normal and there was no valvular heart disease. The urine averaged 1008 in specific gravity and contained traces of albumin and a few hyaline casts. Soon after admission she had three epileptic convulsions in one day (the only ones she has had while in the hospital), after which she was violent for one night and stupid and dull for several days. By July 17th there was complete wrist-drop on the right and partial on the left side. All other movements of

the arms, save those of extension of the wrists, could be made, but weakly. Sensibility to pain and touch was much diminished in the hands and forearms. The muscles of the forearms were soft, flabby, and somewhat atrophied. The œdema of the legs prevented the determination of wasting in them. By November, 1905, she had improved considerably. The wrist-drop had disappeared, but she could not dorsally flex the feet. Pain had ceased in the arms but continued in the legs. By December the œdema of the legs had gone and the calves were seen to be wasted. On January 3d she was seized with a right sided pneumonia from which she is now (February 9th) convalescing, but which caused an increase or rather recurrence of her nervous symptoms. Pain in the hands and extreme tenderness on pressure over the nerves of the arms returned. The soles were painful and sensitive. Anaesthesia did not recur in either the arms or legs. She could not move the toes or feet and only weakly extend and flex the knees. The wasting of the calf muscles increased quite a great deal. She never had any of the symptoms of Korsakoff's psychosis. The only mental symptoms were excitement followed by stupor after the epileptic fits and mental hebetude during the pneumonia. At the present time she talks and behaves like an ignorant and rather stupid but fairly sensible woman.

CASE VII shows very well the typical mental symptoms. The patient, a married woman, aged thirty-seven years, was admitted to the hospital in October, 1905. She was so confused that her account of her illness was worthless. About four weeks before she had begun to be ill with headache, nausea, and vomiting. About a week later she began to complain of pain and tenderness in the legs. She had been a heavy drinker for a long time.

Examination. She was a fairly well-nourished woman, with the alcoholic face. Both feet dropped and she could not stand alone. The legs were painful and the soles were very sensitive. The knee and Achilles jerks were absent. The plantar jerk was normal. Sensibility and motor power were good in the arms. Several weeks after admission the calves were distinctly and the thighs somewhat wasted. She never lost control of the bladder and rectum. The left pupil was a little smaller than the right, both responded promptly to light and with accommodation. There were no cranial nerve palsies. The heart and lungs were normal. After the wasting in the legs appeared the knees became fixedly flexed on the thighs at about a right angle, and any attempt at passive movement caused severe pain. For a time there was marked hyperæsthesia of the skin of the abdomen and chest.

Her mental state was interesting. When no one spoke to her or disturbed her she lay quiet and speechless, paying no attention to anything and at night sleeping well and taking food without trouble. When talked to she became very much confused, fabricated, mixed past and present, had no realization of being ill, was garrulous, and

silly happy, did not know where she was, and recognized old friends in the nurses and doctors. She was sometimes very plausible in her talk, *e. g.*, when told she was in a hospital she replied, "Oh, yes, I came out this morning to see my aunt, but of course I am not a patient." She frequently said she had been out walking with her children or visiting in the morning. She was convinced her mother and children had been to see her and related conversations she had with them. Fancy and fact were inextricably mixed in her daily life and ten minutes after a meal she would declare she had eaten nothing for hours and any bystander was liable to be recognized as a relative and talked to as such, being told incidents, which may or may not have been true, which happened long ago. She was never violent, excited, peevish, or querulous, but always silly happy. Her mental condition remained unchanged till the beginning of February, when in the course of three days all psychical symptoms improved and she became fairly normal. Now (February 8, 1906) her condition is as follows. Both legs are stiff at the knees. There is no foot-drop, and she moves toes and ankles well, but cannot stand, partly because of contractures, partly because of weakness. The only sensory symptom is hyperæsthesia in the soles. There is quite marked atrophy of both calves, slight on both thighs.

CASE VIII also showed characteristic mental symptoms, and is interesting because of the microscopic changes found in the brain. The patient was a woman, aged forty-five years, who had used alcohol to excess for many years. She had been ill for about three weeks previous to her admission on March 2, 1905. She complained of pains in the arms and legs, but could give no clear account of her symptoms.

Examination. She was fat, bleary-eyed, and middle aged. She could walk weakly for a few days after admission, but soon became bedridden. She could move either arm in all directions, but both were weak especially the right. There was no distinct wrist-drop. There was great loss of power in the legs, but not great foot-drop. The knee and Achilles jerks were absent; the plantar reflex normal. The biceps and triceps jerks were present. Pressure over the nerve trunks in the arms and popliteal spaces caused pain and the calves were sore. There were no cranial nerve palsies. The right pupil was a little dilated. Looking to the left caused slight lateral ataxic movements of the eyeballs. There was no oculomotor palsy. She had good control of the bladder and rectum. So far as could be determined there was no anesthesia in the arms or legs. She was much confused. When she first came to the hospital she realized that she was ill and told us, what was not true, that she had broken her wrist and leg by falling a few days before. She did not have the power of imagination of the last patient and did not fabricate so much or so interestingly. After a few days she ceased to realize that she was ill and took it as a matter of course that she should

stay in bed because she was told to do so. She did not know that she was in a hospital, but thought she was in a private house. She paid no attention to her surroundings, and when it was pointed out to her that there were a great number of people in bed for a private house she did not trouble herself about the incongruity of it but simply restated that it was a private house. The nurse she mistook at times for one old friend, at others for another. She had no idea of the passage of time and said sometimes she had been in the hospital three months, at others a couple of weeks. Her memory for both old and recent events was very bad. She could understand a short, simple question and would obey simple commands, but when talked to soon began to wander. About March 10th fever (103° F.) began; she became stupid and congestion of the lungs and later left lobar pneumonia developed. On the 19th she became unconscious and died in a few hours. The necropsy revealed pneumonia, myocarditis with dilatation, chronic diffuse nephritis, and fatty liver. On gross examination the brain and cord appeared normal. Through an oversight none of the peripheral nerves were saved.

Dr. C. D. Camp kindly made a microscopic examination of the brain and cord. Sections from both paracentral lobules showed the pia somewhat thickened but no infiltration with round cells. The bloodvessels of both the pia and cortex were distended with blood and their walls slightly thickened. There were a few amyloid bodies in the cortex just beneath the pia, but no marked proliferation of the neuroglia. The Betz cells, stained with thionin, were swollen, globular, and had lost some or all of their processes. The chromophilic elements stained as a very finely granular mass. The nuclei were centrally located in most of the cells. The cells were deeply pigmented, but probably not more so than is normal in a person of her age. The cervical cord, stained with hæmalum acid fuchsin, showed an apparent increase in the number of bloodvessels probably due to the thickened walls. They were especially well marked in the posterior columns. The anterior horn cells were densely pigmented. The lumbar region stained with the hæmalum acid fuchsin, resembled the cervical. Capillary fibrosis was even more marked. The anterior horn cells, stained with thionin, were much pigmented. The chromophilic element was finely granular and stained feebly, and the nuclei in many cells were visible by the Weigert hæmatoxylin method. A sympathetic ganglion from the lumbar region showed the following condition: The nerve cells much pigmented, and many of them were simply masses of pigment containing no nuclei, in others nuclei were present, but stained faintly with hæmalum fuchsin. There were several microscopic masses of small round-cell infiltration of the connective-tissue sheath of the ganglion. The myelinated nerve fibres passing through the ganglion were small in diameter but normal. It is, of course, too early to speak dogmatically of the morbid anatomy of the mental symptoms occurring in

multiple neuritis, but the changes found in the cortex are of interest. The significance of the changes in the sympathetic ganglion is unknown.

CASE IX is interesting because it is a second attack and because the mental symptoms came on while she was under observation. The patient was a white woman, aged thirty-seven years. She had been a drinker for many years. She was admitted to the hospital in October, 1905, complaining of pains in the legs and arms. There was nothing of importance in her history, save that she had had an attack of acute alcoholic neuritis, and recovered, a year ago. The illness came on only three days before her admission with aching in the ankles and soon after weakness in the legs, so that she often fell when walking.

Examination. She was a large well-nourished woman, with a distinctly jaundiced hue of the skin and conjunctivæ. There was no distinct foot-drop, but dorsal flexion of the feet was impaired. The legs were moved well in all directions. There was no wrist-drop and hands and arms were well used. The muscles of the legs and hip were painful on pressure and the popliteal spaces tender. The knee jerks were absent. There was no anæsthesia of the arms or legs. The pupils reacted well to light and with accommodation and there was no ocular palsy, but when looking to either side a coarse nystagmus appeared. The bladder and rectum were well controlled. There were signs of mitral valvular disease. The liver appeared slightly enlarged, but there was no evidence of a dilated gall-bladder. Both ankles were somewhat cedematous. Seventeen days after her admission mental symptoms came on quite suddenly. She said she had been in the hospital a day and a half and that the night before she had slept in another ward. By this time also some atrophy had appeared in the extensors of the hands and feet and she had become somewhat emaciated. Dates, places, and things were mixed and fact and fancy mingled together. At the same time the pain in the legs increased and the arms began to hurt. Soon after the knees became stiff. Now (February, 1906) both legs are stiffly flexed at a right angle to the thighs and any attempt at passive movement causes pain. There is no foot-drop. Both knee jerks are absent. The soles are exquisitely sensitive. There is no anæsthesia. The calves and thighs are very sensitive to pressure. Pressure over the nerves at and below the knee causes pain. There is no anæsthesia of the legs. The arms are normal in all respects. She realizes where she is and that she has been sick. Memory for past events is much better and is somewhat better for things of to-day, but she is a little demented. She laughs foolishly and behaves much like a child.

In Case X alcohol and lead were joint causes. The patient, a man, aged twenty-seven years, was admitted to the hospital in August, 1903, complaining of slight pain in all his extremities and

inability to move his arms or legs except the fingers of the left hand. He had worked in white lead and been a heavy drinker for a long time. His illness began about three weeks before admission. The onset was rather slow, extending over several days. The first symptom was headache followed by weakness, first in the right wrist, then in the left, and lastly in the legs. There was some pain.

Examination. He could neither stand nor walk. He could flex and extend the arms a very little. Wrist- and foot-drop were present on both sides. There was marked wasting of the muscles of the hands, the forearms, the arms and shoulders. The legs and buttocks were wasted some but not so much as the arms. All the deep reflexes were absent. He controlled the bladder and bowels well. Sensibility was normal on the legs and arms. There was a distinct blue line on the gums. The cranial nerves were normal. The feet became blue and cold when they hung down. Pressure over nerve trunks in legs and arms caused pain. Now (February, 1906) he still is unable to walk and is much wasted. He can flex and extend the legs upon the thighs and the thighs upon the abdomen, and can move the arms a little. There is no wrist-drop, but foot-drop persists. He suffers no pain. His mental state is normal.

ACUTE PARANOIA EXHIBITING CYCLICAL RELAPSES.¹

By THOMAS J. ORBISON, M.D.,

ASSISTANT IN MEDICAL DISPENSARY OF THE HOSPITAL OF THE UNIVERSITY OF PENNSYLVANIA,
THE POLYCLINIC, AND THE ORTHOPÆDIC HOSPITALS, PHILADELPHIA.

THIS is the record of a case in a male in which there was a monthly vasomotor disturbance coincident with the relapse.

I would lay emphasis upon the patient's family history and occupation. The trail leading up the attack itself is clearly blazed: family taint; stress and strain of responsibility too much for mental material; too much "social life;" the inheritance from one side of a capacity for virile ambitions and the desire for achievement—on the other, a lack of the ability to stand the strain that the necessary effort demanded.

Mr. J.'s age was twenty-four years in June, 1903—the date of the onset of this attack. He is unmarried and was engaged in a manufacturing business.

Family History. His father is possessed of a strongly fibred mentality and a robust constitution. His mother was never very strong and has been an invalid for years. She has suffered from diabetes and is of frail make-up. Her mentality is good but not

¹ Read before the Philadelphia Neurological Society.

robust. One sister had an attack of acute mania some years ago consequent upon severe mental stress—she has completely recovered.

Previous History. As a boy the patient was fat, good tempered, normal; he always did well at school and was considered quite bright, though not precocious. When his preparatory school days were over he went through college without incident. In his relations toward the opposite sex he tends to idealism, has been susceptible to a high degree, but has never made himself foolishly conspicuous in this respect, and has always been considered "artistic." He never was conscious, heretofore, of abnormal ideas and entered into all the social and out-door life of his fellows. He did well in his business life and was promoted quickly; has always been healthy and never had his attention called to any mental lapse whatever, up to June, 1903.

I would lay stress upon his occupation, believing it to be one of the chief causative factors in this case: he was placed in charge of a new department in a big business, knowing little of the theoretical or practical sides of it, but having an ambition to make it a success. His social life enforced upon him its late hours and other burdens: he was "burning the candle at both ends." There is no history of alcoholism or specific disease.

Present Illness. Mr. J. came to me June 18, 1903, complaining of mental confusion. For several days he had had, as he expressed them, "mitty ideas." These were found, on close questioning, to be a distortion of normal ideas rather than any delusional concepts. He said that he would sit for a long time without saying anything, and explained it on the ground that he was not sure of himself. There were no hallucinations whatever. The confusional element showed itself in the inability to connect individual ideas into normal sequence. There was no confusion whatever as to time, place, personal identity, etc. He talked quite rationally and complained that he was beginning to lose the ability to write letters and attend to his business. In addition to this he complained of cerebral distress as of great tension inside the head; expressed a fear lest his actions be peculiar and noticeable, for he realized that his thoughts and feelings were not normal. He never noticed a similar condition prior to this, and was positive that this had lasted but a few days and said it was growing unbearable, but did not see how he could possibly give up his work. He said he was harassed by insomnia. His bowels were habitually constipated.

Physical examination showed him to be under weight, his weight being only one hundred and thirty-six pounds, while his height was five feet ten and a half inches. His musculature was good, but the skin was muddy and showed a lot of little pustules on the face and body. The tendon reactions were normal. His tongue was quite coated, his breath offensive, and his eyes bloodshot.

Nothing abnormal was noted as to heart, lungs, and abdomen.

Urine examination showed no abnormality.

His father was warned of an approaching mental disturbance of considerable severity and probably long duration. A course of treatment was instituted and the patient kept under strict observation. For a time he got better—or rather felt better. He received no letters and wrote none; did not care to read, but thought he ought to read the Bible. As he felt better the eyes became less bloodshot, and brain tension disappeared; he felt brighter and but little confused; he enjoyed the routine of his treatment and life and said he thought he would soon be able to resume his work. Nevertheless, any mental work tired him and he felt unable to fix his attention on any subject—even the newspaper—and said he could not follow any one line of thought.

This period of betterment lasted about two weeks, when it was noticed that he began again to be preoccupied and quieter than usual. His eyes became reddened and watery looking, and he would laugh in a silly, explosive way without cause, and immediately after compose his features in the attempt to fix his mind on what was going on. Unless he was aroused he would sit for a long time gazing fixedly. He soon exhibited marked delusional ideas, *e. g.*, his father might be cheated in business; he himself was noticed by passers-by, and their conversation was directed at him, etc.

This was annoying but did not worry him excessively, because he reasoned that they had no cause to dislike him or do him harm. He said that this made him quiet because if he talked they might misunderstand him, etc.

The inability to sleep returned. It was noted that he passed larger quantities of urine than at first. His weight had increased somewhat, but now remained stationary.

He could be made to understand that his delusions were such and it quite relieved him to know it, nevertheless the abnormal ideas would persist. He was neither melancholic nor maniacal, though he was passively unhappy and depressed. Relapse came gradually, taking several days to reach its height; it remained about the same for a few days and then began to subside. The subsidence was quicker than the rest of the relapse—the whole time being about twelve to fourteen days. After it there came a period in which he felt very much better in every way—reaching a higher level than in the preceding period of betterment. During this period he wrote a letter to his family which was normal in every way. But when questioned closely he said there still remained a taint of vicious ratiocination—though he was better able to overcome it by reasoning. Toward the end of the first relapse after the first onset he was sent on a travelling trip with an attendant. A second relapse came on like the first, lasted about as long and ended in the same way. The delusions were similar—being that the people near him were talking about him and discussing his mental condition. At this time he

thought the attendant was attempting to play a joke on him and was trying to distort his (the patient's) words, etc.

It was not until a third relapse that the periodicity of the attacks was realized fully and future relapses predicted with some exactitude as to time. At this time his family was notified of the situation and a prognosis given conditional upon a certain course of treatment. The course of the relapses was now about as follows: Outward signs; patient preoccupied and distraught; eyes bloodshot; personality changing from normally friendly to reserved and finally to suspicious; facies at first dull and expressionless, afterward satyric and smirking, the patient giving way to silly bursts of laughter that were quickly suppressed. Mental signs: acute self-consciousness; intense egotism; fear of doing and saying the wrong thing; suspicious of innuendo and hidden meanings; at times thinking that people about him considered him vain, stilted, and hypocritical—at these times he was uncertain whether to resent the (supposed) remarks about him, yet hesitated to do so because he feared he would be misunderstood in that also.

The course of these relapses was about ten to fourteen days and ended rather abruptly.

I wish to emphasize the absence of hallucinations, melancholia, and mania; the fact that between relapses there was never a time when he was absolutely free from the taint of delusions; that between relapses his personality, facies, and mental exhibitions were radically different from what they were during the relapse; that there were no signs of catalepsy, no true dementia, although the silly expression and explosive laughter were looked upon as danger signals; *especially* that each relapse was ushered in and continuous with marked vasomotor disturbance, viz., overfilling of the cranial bloodvessels shown so plainly in the eyeballs, and suspected in the kidneys, because of the large quantities of urine voided during the relapse.

The course of the illness lasted from June 18, 1903, to June 23, 1904. During this time there were ten relapses, inclusive, as follows:

June 18th to 28th, July 20th to 31st, August 25th to September 5th, September 23d to October 4th, November 12th to November 24th, slight; December 20th to January 16th, bad; March 17th to 26th, April 2d to 10th, May 23d to June 2d, June 13th to 19th, since June 22d no symptoms.

Such is the record of a single case. The special interests that attach themselves to this one arose from the fact that in part it resembled such psychoses as dementia præcox, periodic insanity, and acute paranoia.

Before attempting a differential diagnosis I will give as typical the notes taken at the time of the March relapse and likewise of the last one that occurred—the second June relapse of the series:

"*March 17th.* Mr. J. has begun to show signs of coming relapse. For last few days has been preoccupied. Today somewhat confused. Eyes bloodshot.

"18th. Begins to show mental irritation. Is suspicious and sensitive. Says attendant is 'throwing dust in my eyes' (meaning by this that he has some hidden meaning attached to his words). Is headstrong and if opposed thinks it is because it is desired to humiliate him.

"19th. Still very sarcastic and suspicious (in his attempt to resent and parry supposed shafts of sarcasm—though absolutely nothing was said to him except the most ordinary remarks)."

This relapse lasted until the 26th, on which day he was free from the mental confusion, suspicion, and cross delusions. Notes say: "Eyes no longer bloodshot, sleeps better and feels much better. When closely questioned says he realizes that the relapses are abnormal and even during them he has begun to realize that it is a relapse and will pass. Says he is almost free from any taint between relapses."

The notes of the next relapse are as follows: "June 15th, returned from ——— this afternoon. While there had a return of abnormal ideas. Thought total strangers were talking about him, etc.

"*June 16th.* About the same. Preoccupied and distrait.

"18th. Talked freely about his condition; said he felt he was doing right but that accusing thoughts came to him. Considerably confused in his ideas. Eyes bloodshot.

"19th. Was made to appreciate that he must realize the abnormality of his present state. Cautioned not to lay stress upon the foolish ideas. Said he felt better for having talked over the matter.

"20th. Ideas clearer. Is somewhat depressed in spirits, but not confused. Says he feels 'blue,' but not entirely cast down. Is not disheartened.

"22d. Has no delusions and can talk of past depression quite sensibly. Says he can look back on it and remember all the details. Realizes his former state of mind pretty well. Expressed wonder at the possibility of such ideas possessing him."

That is the end of the record—except that since then (June 22d) there have been absolutely no abnormal symptoms. Patient weighed one hundred and seventy-six pounds when I last saw him (a gain of forty pounds), and had never been better.

This case resembles certain forms of dementia præcox.

I had under my care a few years ago a case of hebephrenia in a girl sent me by Dr. Wharton Sinkler. It will be referred to as Case A. About the same time I had another case of dementia præcox of the paranoidal type in a young man which will be referred to as Case B. Both cases had a marked resemblance in some of their characteristic symptoms to the case under discussion, likewise marked differences.

In Case A there was the same confusional onset: change of

personality, preoccupation followed by silly explosive laughter and accompanied by vasomotor disturbances; acute symptoms ending comparatively suddenly and followed by a period of betterment. There were no fixed delusions noted—but rather a change from mental confusion to a depressed state and then to the silly stage when she was possessed with foolish ideas, sometimes expansive, sometimes obstinate and destructive; after this almost invariably came a mental storm at times maniacal in its fury—and then the period of betterment. All symptoms were exaggerated during the menstrual period.

There was a record in this case of repeated attacks followed by recovery, but ending ultimately in dementia.

In Case B there was preoccupation, mental confusion, a like vasomotor disturbance, silly, explosive laughter, satyric facies, etc., but their exhibition was not manifested in the same sequence or degree. In addition there were expansive ideas, marked delusions of various kinds and deep seated; also a period of mania; later there were marked dementia symptoms, *e. g.*, drooling of saliva, inability to articulate, failure to recognize anyone, and for more than a week could not make the efforts required during deglutition; then a cataleptic state with fixed stare, etc. This man progressed gradually but surely along the difficult road to a complete recovery.

Now, in contradistinction to these fairly typical cases of two distinct types of dementia præcox the case under discussion presented the clinical picture of cyclical relapses foretellable both as to time and as to length; no evidence of mania; the dementia symptoms never going beyond the danger signal stage. There never was a time from first to last when one could say there was no mental taint, yet the periods between the relapses were such that many people who were quite intimate with the patient never realized his condition, having seen him only between relapses.

Inasmuch as it presents the "periodic expression of a similar set of symptoms" it bears a close resemblance to the idiopathic periodic insanities of Kraft-Ebing, except that there were no periods of complete recovery. It is not a circular insanity, inasmuch as there was exhibited neither melancholia nor mania.

Kraft-Ebing speaks of a periodic hallucinatory insanity that very closely corresponds to this one in the sequence of its expression, except that this case is a delusional form and not hallucinatory.

The difference rests upon the fact that there is no period of recovery during the course of my case.

Neftel publishes a case of recurring melancholia in which there was vasomotor spasm. He considered the melancholia due to the resulting anemia.

In my case there were recurring relapses with vasomotor dilatation. Were the relapses due to the vasomotor disturbance or were they synchronous symptoms?

Meynert considers that over-filled cerebral bloodvessels are a

cause of mania and that the mania of circular insanity is due to such over-filling. In my case there was distinct over-filling but no mania. Kraft-Ebing rejects Meynert's theory.

Finally we come to acute paranoia. While Kraft-Ebing does not recognize such a condition but confines himself to the statement that the distinctive feature of paranoia is its chronicity, yet his description of certain forms of paranoia correspond quite fully to this case of mine—minus the chronicity.

Kraepelin, however, considers acute paranoia an intermediary disease between chronic paranoia and the emotional psychoses (mania and melancholia). Meynert pointed out especially the fact that in all these psychoses the characteristic traits are a condition of confused consciousness and a difficulty of orientation; he applied the term confusion to the whole group of these diseases and did not include chronic paranoia. No distinction was made between acute mental confusion and acute paranoia.

One writer commenting on acute paranoia says its most noticeable sign is the delirious relation of the patient to his surroundings.

Schuele says it is characterized by the fixed nature of the hallucinations and delirium, the condition of consciousness playing an unimportant part here.

In the diagnosis of a disease the symptoms are a measure of certain values. In this case the symptoms indicate a form of insanity, characterized by mental confusion and delusions of a persecutory character, in the course of which relapses presented themselves in distinct monthly cycles accompanied by marked vasomotor disturbances.

I fail to find in the text-books and other literature I have examined a case presenting a similar set of symptoms.

I incline to the diagnosis of acute paranoia exhibiting cyclical relapses.

NOTE.—May 21, 1906. The patient continues in excellent health, with no return of abnormal symptoms.

THE BREUS HÆMATOMMOLE.

By ARTHUR H. BILL, A.M., M.D.,

ASSISTANT IN OBSTETRICS, THE WESTERN RESERVE UNIVERSITY, CLEVELAND.

FROM the time when Breus, in 1892, in a monograph entitled *Das tuberöse subchoriale Hæmatom der Decidua*, first described this as a distinct form of mole pregnancy there has been the widest difference of opinion on the part of those who have interested themselves in its investigation. At first these men were loath to accept this mole as a separate and distinct form, and two writers, namely,

Neumann and Mirabeau, have attempted to classify it with the blood moles. There have been in all about thirty-five cases of this rare mole reported by various writers and while most of them now agree with Breus in its existence and chief gross characteristics, they are still far from agreeing as to the histological changes and the underlying causes of its peculiar form.

In his monograph Breus,¹ while reporting five typical cases of this form of mole, describes the cardinal characteristics as follows:

1. That there is a marked disproportion between the size of the embryo and that of the ovum, and also a marked discrepancy between the apparent ages of both ovum and embryo, as determined by their size and development, and the period of pregnancy, as obtained from the history of the case. In the most striking of Breus' cases the patient had given a history of pregnancy of eleven months' duration, while the ovum expelled had merely the size of a three months' pregnancy and the embryo had a length of merely 1.5 cm.

2. There is an absence of any circulation between the foetus and the placenta; that is, there is an absence of bloodvessels in the chorion.

3. The presence on the inner or fetal surface of the placenta of hæmatomata which, covered with amnion and chorion, bulge into the cavity of the ovum. Breus laid special stress upon the form of these hæmatomata, which were in his cases often lobulated and here and there had such constricted bases as to become almost pediculated. He explained their formation by an outpouring of blood from the decidual vessels into preformed sac-like folds of the chorioamnion, and thought that this folding was brought about by a disproportionate growth of the membranes after the death of the embryo, at the same time claiming that in the death of the embryo lay the ultimate cause of all.

Shortly afterward Walther² reported a similar case in which he agreed with Breus in all essentials and at the same time attributed the growth of the membranes after the death of the embryo to an endometritis, by which he thought the membranes were better nourished than usual and thus stimulated to a more rapid growth.

Contrary to these two views, Neumann⁴ denied any growth whatever of the membranes after the death of the embryo, and far from attempting to explain the development and form of the mole, claimed that it was identical with the ordinary blood and carneous moles. To substantiate his theory, Neumann reported ten cases, some of which were certainly blood moles, but had, however, none of the characteristics of the Breus mole. In these cases the embryos varied in size from that of two months to that of a six months' foetus, and only two showed a disproportion between the size of the embryo and that of the ovum. Furthermore, none of Neumann's cases showed the characteristic lobulated forms of hæmatomata

which Breus described. Contrary to Breus, Neumann claimed that the hemorrhages were primary and that the death of the embryo followed later, that by the hemorrhages the chorioamnion was forced out mechanically. He also held that the bleeding could come from the vessels of the chorion as well as from the decidual vessels, or in most of his cases the vascularization of the chorion had reached an advanced stage. Later, Mirabeau¹⁷ took a similar stand with Neumann, while all of the other writers on the subject have agreed with Breus in the essential characteristics, putting these moles in a distinct class and only differing from each other in their explanation of the underlying causes. Thus, Gottschalk,⁵ while agreeing with Breus that there was a folding of the amnion and chorion leading to the formation of sacs into which there was a subsequent flow of blood, attributed the ultimate cause to an insufficiency of the primitive heart formation of the embryo with a consequent lack of circulation between it and the placenta.

Davidson,⁷ while reporting two cases, denied any growth of the membranes whatever after the death of the embryo and explained the disproportion between their sizes by the presence of hydramnios at an earlier period in the course of the pregnancy, the fluid having been absorbed later on, thus leaving a considerable diminution of pressure within the sac and a consequent tendency to an inward bulging. In this Taussig⁸ agreed with Davidson on purely theoretical grounds.

The latest writer on the subject, Bauereisen,¹⁸ again turned toward the theory first held by Walther and found an endometritis which he held as the ultimate cause of the Breus mole, while declaring the direct cause of the formation of the hamatomata to be the stoppage of the outflowing blood by detached chorionic villi which pressed on the veins of the decidua. He at the same time suggested the name "Aneurysmamole" as more appropriate than that of hamatommoles, on the ground that the protuberances were dilata-tions of blood spaces rather than extravasations of blood.

The following case, although in a very early stage of its development, seems to show some of its essential characteristics more clearly than the more advanced cases in which the early features of the formation are overshadowed or lost sight of entirely in the completely developed mole.

The case is from the clinic of Professor Chrobak, in Vienna, to whom I am indebted for the privilege of studying and reporting the mole.

The patient is a primipara, twenty years old, giving no history of any previous illness. The menses were always regular every three weeks after the sixteenth year. The duration was as a rule three days. The cessation of normal menstruation was July 26th, although three weeks later, August 17th, there was a scanty flow. In the middle of November there was again a slight bleeding, but

simply for one day. On December 18th labor pains began which after about five hours' duration resulted in the expulsion of the ovum and embryo, accompanied by considerable bleeding. A thorough examination of the uterus was made immediately after the admission of the patient to the hospital, but no traces of retained membranes or placenta were found. The temperature on admission was 37.4°C ., and afterward remained constantly below 37°C . There was rapid and good involution of the uterus and the patient was discharged in one week. There were no evidences whatever of endometritis.

The ovum is covered over about one-third of its outer surface by a well-formed placenta which measures 5×5 cm. and varies in thickness from 0.4 to 0.8 cm. The maternal surface of the placenta is for the most part of a pale grayish color and smooth, with the exception of slight markings of the primitive cotyledons. The remaining two-thirds of the surface of the ovum is smooth and entirely devoid of decidua reflexa, except over a small area 2×0.8 cm. continuous with the placental border, forming as it were a primitive placenta succenturiata. Over this area the membrane is about 2 mm. thick and on its outer surface portions of decidua reflexa are attached. The chorion is apparently slightly thickened. The amnion appears as a thin delicate membrane entirely separated from the chorion over its entire surface to the insertion of the umbilical cord and apparently is not thickened.

The cord, 25 mm. in length and about 1.5 mm. in diameter, has a slightly eccentric insertion into the placenta and is of a dull grayish color. To its end is attached a poorly developed but fairly well-preserved embryo which has a length of 21 mm. The embryo shows little or no curving. The eyes are quite distinct. The mouth is just to be made out. No trace of the ears can be seen. Three pairs of branchial arches can be easily made out, the upper pair of which has just united in the median line below the mouth while the two lower pairs are widely separated. The upper extremities appear merely as buds, on the right of which a slight furrow marks the beginning subdivision into hand and arm. The lower extremities appear as mere buds and no subdivisions can be made out. The abdominal and thoracic cavities are not completely closed in. Thus the embryo represents, in all probability, an age of between five and six weeks.

The chief interest, however, lies in the inner surface of the placenta, over which are scattered numerous protuberances, varying in size and shape, of a dull reddish color and projecting into the cavity of the ovum (see figure).

These protuberances are everywhere covered by a smooth membrane, the chorion. The smaller ones, not more than 2 mm. in diameter, are perfectly round, while the larger ones have an irregular distinctly lobulated form. They are especially large and abundant

near the insertion of the cord. In one part a prominent ridge is seen running from the region of the cord and dividing into two branches to unite with two of the protuberances giving a distinct stem-like appearance. Between the distinct and well-marked protuberances the surface of the placenta is uneven and irregularly elevated in places. Over that part of the chorion to which portions of decidua reflexa remain attached are also some very small, slightly elevated nodules of a dull reddish color, similar in appearance to those found over the placental region. On section these protuberances appear as homogeneous, red, partly organized masses of blood, covered on their surface by a strong membrane, the chorion, which is intimately attached to it. Under the blood mass is a layer of paler



Hæmatomole. View of the internal surface of the ovum, showing the hæmatomata and the embryo.

decidual tissue. Section in one part shows an even round hæmatoma almost entirely buried in the placental tissue and not protruding enough to be visible above the surface. This furnished an interesting contrast to the theory originally held by Breus that the hæmatomata were preceded by the formation of sac-like dilatations of the chorion and showed that in some cases at least distinct hæmatomata of a considerable size may be formed without any elevation of the chorion whatever.

Sections made of various parts of the mole, including various hæmatomata, the central portion with the insertion of the cord, also of the cord itself, and of parts of the peripheral membranes, show the following:

The amnion is seen to consist of the normal one row of low epithelium and under this of a thin layer of loose connective tissue with comparatively few long spindle-shaped cells. No thickening of

the amnion is observed. There are no vessels whatever in the amnion.

The chorion over the surface of the placenta and also the chorion læve are apparently of about the normal thickness and in places show a very slight tendency to folding. The epithelium is intact and everywhere consists of a complete row of syncytium, while the Langhans cells only in a few places form a complete row, and for the most part are either wanting entirely or only seen at varying intervals. The connective tissue of the chorion is about normal in amount and shows a fibrillary construction with long spindle-shaped cells.

Extending down from the superficial chorion as far as the decidua the primary villi are seen as thick, strong ingrowths of the chorionic connective tissue covered with the same epithelium as that of the superficial chorion. A very noticeable feature is that nowhere can any traces of bloodvessels be found in the villi. The primary villi run for the most part in a fairly straight course and show comparatively little tendency to branching. In one place, near the insertion of the cord, one of these primary villi lies flat along the under surface of the superficial chorion, which it elevates slightly, giving the appearance of the stem-like formation described in the gross examination. This, while evidently having had at first a diagonal course, gives the impression that it had been forced up against the surface by some pressure from beneath, and also that it had played no role in the general formation of the placenta.

The protuberances themselves are made up almost entirely of blood in a more or less advanced stage of organization while there is occasionally seen a trace of a dead villus embedded in this mass. Although the villi are more numerous below the general level of the placental surface there is everywhere a very marked scarcity of secondary villi and those present are in a marked stage of degeneration.

Upon careful examination of the secondary villi a striking feature is the condition of the epithelium which, over the best-preserved villi, consists of but one complete row, and this in places is very low and in others entirely absent. It is noteworthy that over the part of the villi devoid of epithelium there is a deposit of fibrin, and the villi, entirely devoid of epithelium, are seen entirely embedded in fibrin, while around those with intact epithelium there is free uncoagulated blood. Some beautiful examples are seen of villi only partially devoid of epithelium on which there is a heavy deposit of fibrin over the denuded area alone, while the remaining part floats free in the blood. These areas show the similarity between the epithelium of the villi and the endothelium of the bloodvessels in their function of preventing a coagulation of the blood which flows over its surface, a fact very important in the early formation of the placenta. Bauereisen evidently referred to these deposits

of fibrin, which in places reached a considerable size and contained numerous villi, when he said that in places there was an appearance not unlike that of the white infarction of the placenta. Since they have nowhere traces of vessels the villi themselves, thus surrounded by fibrin, are cut off from their only source of nutrition, namely, absorption from the intervillous blood space, and are found in various stages of necrobiosis, so that in some areas they are scarcely to be recognized as villi. By this process a large part of the secondary villi have been destroyed. The primary villi, on the other hand, with the better preserved epithelium, escaped almost entirely.

Another noticeable feature of each section is the persistence of the trophoblasts, which appear occasionally in isolated groups, but for the most part near the decidual surface and in intimate relation with the decidual vessels, which they are apparently opening up. As they do this apparently, in part at least, independently of the villi there results a diffuse flow of blood into the intervillous space.

The so-called layer of Nitabuch is present as a comparatively thick deposit of fibrin over the decidua.

The decidua compacta makes up the outermost part of the placenta and shows few abnormal changes. In thickness it varies considerably in places corresponding to the hæmatomata, being considerably thinned out so as to give the appearance of papillæ projecting up into the intervillous blood space, which Walther described as growths of the decidua between the hæmatomata. It would seem, however, that this appearance was due rather to the fact that the decidua had been thinned out markedly between these by the opening up of its vessels by the trophoblasts, and it is noteworthy that these thinner portions correspond to the larger hæmatomata. The vessels of the decidua in the thicker portions are fairly numerous, to a large extent empty and somewhat flattened out, so that they appear as mere slits in the decidual tissue. In the portions of the decidua under the hæmatomata comparatively few vessels remain, having been opened up to a great extent by the trophoblasts. One excellent example of the opening up of a vessel was seen in which endothelium lined the vessel on the side nearest the decidua while on the other side a chorionic villus projected into the lumen covered on its surface by two distinct layers of cells, namely, syncytium and Langhans cells. In the decidua are also to be seen a small number of chorionic wandering cells which appear merely as isolated cells, nowhere in groups. These are situated for the most part near the inner portion of the decidua and have nowhere penetrated beyond its centre. There is also a slight degree of round-cell infiltration of the decidua, a fact also mentioned by Breus, but nowhere reported as a prominent feature, except by Micholitch, whose specimen, however, was not a pure Breus mole, but was complicated by other changes, including cystic formations. In one place

a small diffuse apparently fresh hæmorrhage into the decidua tissue is seen, so that the decidua cells are widely separated mechanically from one another. This is in the outer portion of the decidua and has no connection whatever with the hæmatomata. No degeneration of the decidua cells can be made out. Nowhere have the chorionic villi grown completely through the decidua as in one of the cases described by Breus.

Sections of that part of the peripheral membranes near the edge of the placenta, which also showed small slightly elevated protuberances, show decidua compacta which is apparently normal in structure. The chorionic villi are comparatively few in number, the large ones being well preserved and covered with a single row of epithelium, while the smaller ones were often found dead among masses of fibrin, blood, etc., and devoid of epithelium. Cross-sections of the umbilical cord show the presence of three columns of cells corresponding to the two umbilical arteries and the umbilical vein. These were surrounded by the Wharton jelly. They have apparently no lumen, but are made up of small cells with round, deeply stained nuclei. These columns of cells extend along the cord to a point above its insertion into the placenta, where they end abruptly and further on in the chorion no traces of vessels are to be found. There are no remains of a yolk sac to be found.

From the findings of the above examination it would appear that there had been an early attempt at the formation of vessels to connect the embryo with the placenta, that is a placental circulation, and that this process had been checked suddenly in its extent. Bauereisen reported the presence of traces of bloodvessels in the chorion and even as far as the villi, but these were nowhere well formed and merely tend to show that the process of vascularization had extended to a slight degree farther on, where it was also checked. The fact that the age of the embryo in these cases corresponds so nearly with the usual time of vascularization would lead to the idea that the sudden cessation was due to the death of the embryo as the most plausible cause and that the various stages of vascularization were due simply to a slight variation in the ages of the various embryo. But it is noteworthy that in all the cases of true hæmatommoles reported the embryo has died before a vascularization of the chorionic villi has been accomplished.

The most striking characteristic of the chorion was the condition of its epithelium which has been given comparatively little attention in the reports of the other moles. Instead of the even two-rowed epithelium of the chorion which is normally present at this stage in the development there is, especially over the smaller villi, a marked thinning out of the epithelium, so that Langhans' layer of cells is either wanting entirely or appears only in the form of isolated cells and the syncytial layer is also broken in places. This condition of the epithelium may be partly explained by the fact that the villi,

whose epithelium absorbs fluid from the intervillous blood space, but which have no vessels to carry it off, become œdematous and this leads to a stretching of the superficial epithelium with a consequent break in its continuity in places and a subsequent desquamation. This process would seem in a way to be like that in the formation of the hydatidiform mole, but in the latter the excessive growth of the epithelium would more than keep pace with the swollen villi and would thus prevent a mechanical break in its course, while in the case of the hæmatommole there is an apparent general lack of growth on the part of the epithelium and an apparent arrest in the development of the chorion before a time when the secondary villi are well formed, which in itself is undoubtedly an important cause of the lack of sufficient epithelium. According to this theory the disappearance of the epithelium would be to a certain extent due to a purely mechanical cause.

With the disappearance of the epithelium there is a deposit of fibrin on the surface which, shutting off the only source of nutrition, leads to necrobiosis of the villi. With the death of many of these secondary villi, of which altogether very few have been formed, spaces are left practically devoid of living villi, a fact especially noted at the seat of the hæmatomata. Here again it seemed to be around these groups of dead villi that the hæmatomata formed. The chorion on the surface showed a slight tendency to folding.

With the necrosis and breaking off of the secondary villi there are left only the primary villi bounding spaces which are really enlargements of the intervillous blood spaces. Into these spaces between the primary villi, containing chiefly dead secondary villi which would furnish no support, there was probably a flow of blood which mechanically forced the wall up into the protuberances. This is strengthened by the fact that the microscopic examination showed the hæmatomata to be limited by the primary villi, and in the case of the lobular hæmatomata the lobulated form was caused by the presence of a strong primary villus which would not allow a bulging of the wall at that point. The fact that the hæmatomata are not always protruding above the surface, but may be entirely within the placenta, so as not to be noticed except on section, would tend to strengthen this view as against that of Breus and Walther, who thought that there were preformed sacs, and that into these the hemorrhages took place. The preformed sacs, if such they may be called, are merely enlargements of the intervillous blood spaces due to the death of the secondary villi. It was claimed by Breus that without a previous formation of sacs the lobulated forms and those with markedly constricted bases could not be explained, but as was seen in this specimen the constrictions between the lobules were due to the resistance and strength of the primary villi, and as these sometimes run obliquely into the placenta so as to come

together at their bases the stem-like formation would thus be explained.

The persistence of the trophoblasts and the progressive opening up of new decidual vessels, often apparently independently of the villi, would lead to the continual addition of new blood streams. Under the pressure of this blood distention can take place in only one direction, that of the amniochorion, since the decidua below and the strong primary villi laterally are resistant enough to prevent distention in these directions.

The increase in the size of the hamatomata is thus due to a mechanical stretching of the amniochorion and may go on to a considerable extent, while the base is limited in size to the space between the primary villi and is constant, thus giving rise to the apparently stem-like forms. In this case no empty sacs were present. The fact that after the death of the embryo and the continued growth of the sac there would be an unequal pressure, would also tend to favor the formation of the protuberances, which would also be furthered by the uterine contractions. To assume the presence of hydramnios at an earlier period in the development is unnecessary.

In the present case there was no sign of endometritis. Gottschalk curetted the uterus in his case and found no endometritis whatever, so that, although Bauereisen and Walther found the presence of endometritis in their cases, this cannot be given as a causative factor in the development of the mole. A slight degree of infiltration of the decidua has been reported in several other cases, but never to such an extent as to have any weight.

As to the further changes which the ovum and embryo may undergo after long retention in the uterus very little is known. The embryos are usually very well preserved even after eleven months' retention, as shown in one of Breus' cases. As was seen in the present case, slight œdema of the chorionic villi has also been reported in other cases, while Veit stated that not infrequently in cases in which the ovum has been long retained in the uterus the same condition of the villi may be present as in the hydatidiform mole. This of course can be taken to apply merely to the presence of collections of fluid since no increased growth of the epithelium is present. Mickolitch reported one case of Breus mole, with the formation of bladder-like sacs in the chorionic villi, giving a picture very much like the hydatidiform mole, the only case of its kind on record; but while there may be a marked œdema leading even to these bladder-like sacs, none of the other characteristics of the hydatidiform mole are shown, there being no tendency toward an excessive growth of the epithelium of the villi but rather a retrogression.

There is no record of any case leading to metastasis or showing any signs of malignancy as in the hydatidiform mole. This fact

naturally has a distinct bearing upon the treatment which should be followed in these cases.

With the long retention of the ovum and embryo the latter seems to undergo a process of shrinking, for an analysis of the cases on record shows that the embryos are smaller in cases in which they are retained over nine months. This fact, together with the increase in size of the ovum after the death of the embryo, accounts for the marked disproportion between the two.

SYMPTOMS. The clinical picture is that of a "missed abortion." The age of occurrence is less than that of the hydatidiform mole and is usually between twenty-five and thirty-five years, that is at the time when abortion is most common. It occurs more commonly in multiparous patients than in primiparæ, one case reported being that of a woman in her twelfth pregnancy. The previous history may be entirely negative and usually there is no history of endometritis and no previous abortions, although in one case the patient had aborted four times during the previous year. In Walther's case the patient had previously had two hydatidiform mol s, but otherwise there had been no abortions. Taussig saw two Breus moles in the same patient. At first there are the ordinary symptoms of pregnancy, the cessation of menses together with all the subjective and objective signs. But after a long period of amenorrhœa there is not a proportional increase in the size of the abdomen, the uterus usually not growing beyond the size of a three or four months' pregnancy. The longest period of retention of the ovum was eleven months. In about three-quarters of the cases there was bleeding, often several months before the expulsion of the sac, and occasionally so marked as to be an alarming symptom. The hemorrhage is usually accompanied by pain in the abdomen. The expulsion is usually not accompanied or followed by fever.

DIAGNOSIS. This is usually not made before the expulsion of the ovum, as it is difficult to distinguish it clinically from the ordinary retained ovum. In the latter, however, there is often a foul-smelling discharge accompanied by fever and general disturbances, symptoms which have not as yet been observed in cases of Breus mole. The physical signs are directly the opposite of those seen in the case of the hydatidiform mole, in which the uterus grows out of all proportion to the duration of pregnancy. As a rule, it is not difficult to distinguish it from tumors which are not the result of pregnancy, since the usual signs of pregnancy which are present serve to make this distinction. The diagnosis of myoma has, however, been made. A summary of the clinical and pathological characteristics which will serve in the diagnosis is as follows:

1. The marked disproportion between the size of the embryo and the period of gestation.
2. The relative absence of symptoms of intoxication from the long retention.

3. The disproportion between the size of the embryo and that of the ovum.

4. The presence of the tuberous hæmatomata, which may be lobulated and have constricted bases.

5. The lack of bloodvessels in the chorionic villi.

6. The poor development of the epithelium of the chorionic villi, which may be entirely absent, the layer of Langhans' cells being particularly poorly formed.

7. The persistence of the trophoblasts.

8. The poor development of the embryo, which may not be found at all, having been absorbed. It usually corresponds in size to that of four to six weeks' development.

The prognosis is good. There is as a rule no recurrence, although one case has been reported in which a second hæmatommole was formed within a year. There is no infiltration of the uterine wall by the mole. The only troublesome symptom, the hemorrhage, while in some cases rather severe has never proved to be a serious complication. The presence of broken-off villi in the decidual vessels, which were described by one writer suggests the possibility of embolism, but this has never as yet been observed.

The treatment which has been adopted in practically all of the cases on record has been an expectant one. This has been due, in all probability, to the fact that the diagnosis has rarely been made previous to the expulsion of the ovum. If the diagnosis were made, the question of emptying the uterus by the usual methods would suggest itself, but its indication is an unsettled point. In the presence of excessive hemorrhage, however, immediate emptying of the uterus is indicated.

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A METHOD FOR THE ISOLATION OF TYPHOID AND COLON BACILLI FROM DRINKING WATERS, ETC.

BY T. A. STARKEY, M.B., D.P.H. (LOND.).

PROFESSOR OF HYGIENE, MC GILL UNIVERSITY, MONTREAL, CANADA; MEMBER OF THE ROYAL SANITARY INSTITUTE.

THE problem of separating typhoid bacilli from samples of drinking waters, etc., by a method which shall at the same time be certain, easy, and fairly rapid, has received the attention of numerous investigators. As a result of all their researches we have various modes of isolation and diagnosis of these organisms. Eliminating the processes of "proving" the organism either colon or typhoid bacilli—the difficulty always presented is that of isolating the particular bacillus, and this, I think, is the greatest obstacle which we have to overcome. When these organisms are present only in very minute quantities, accompanied, or perhaps crowded out, by numerous other bacteria, then, indeed, the difficulty of isolation becomes almost insuperable.

Bacteriologists will, I am sure, agree that under such conditions a great deal of time and labor is demanded, and they must often be much surprised by the ease and rapidity with which colon and typhoid bacilli are often diagnosed with certainty by novices.

In my own experience I find that the usual test applied is a "presumptive test," namely, the production of gas in glucose broth, or some modification of this. This is more often than not the extent of the investigations. Now there is no denying the fact that, over and over again, by such incomplete work, an incalculable amount of damage is done—a public or private water supply, for instance, is glibly condemned on such flimsy evidence. The remarks contained in the Report of the Massachusetts State Board of Health, 1903, p. 263-264, suggest the situation admirably.

As regards the various special media which have been recommended for promoting the growth of colon and typhoid bacilli, nothing need be said here. They are all well known and some of them are extremely useful.

Before describing my method of isolation which depends largely upon the motility possessed by these two organisms, reference must be made to one or two bacteriologists who have attempted to avail themselves of this property of movement, viz., Pakes,¹ Cambier,² Moore,³ and Stoddart.⁴ They do not seem to have been encouraged by their results and abandoned them as not leading to any practical outcome.

The method which I here put forward is based upon three facts appertaining to colon and typhoid bacilli:

First, their motility.

Second, their power to grow in some medium which possesses a restraining action upon many other bacteria.

Third, their ability to grow anaerobically.

Expressed briefly the rationale of the work is as follows:

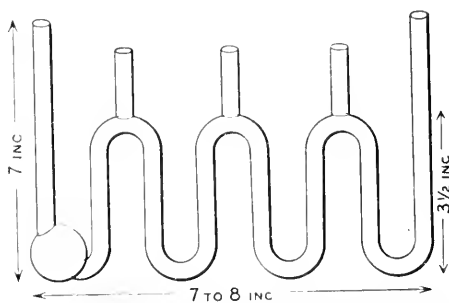
1. The motility will separate the colon and typhoid bacilli from non-motile organisms, and from those less motile than themselves.

2. The restraining medium prevents the ready growth of most organisms except colon and typhoid bacilli:

3. The anaerobic conditions prevent the development of aerobic organisms which form the majority of bacteria with which one comes into contact in ordinary bacteriological examinations.

These three factors when acting together at the same time practically ensure colon and typhoid bacilli having the ascendancy.

The following are the details of the method of applying the principles:



Apparatus for isolating typhoid and colon bacilli.

Apparatus. A piece of glass tubing, one-quarter or, better, three-eighths of an inch in diameter, is bent in the manner shown in the accompanying illustration. A bulb is blown near the lower part of the first limb (bulb about 8 or 10 c.c. capacity) and observation openings are made in the uppermost parts of the bent portions.

¹ Bact. Examination of Water, by Honoeks, p. 102.

² Revue d'Hygiene, 1902, p. 64.

³ British Medical Journal, March, 1902, p. 773.

⁴ Personal Communication, 1901.

This apparatus is filled with ordinary nutrient broth (*titre*, + 1 per cent. normal acid), to which 0.05 per cent. pure carbolic acid has been added. The openings are plugged with wool and the whole sterilized in Koch's sterilizer for one hour. Inoculations are made at the bulbous end. The tube is then placed beneath a bell jar, in which perfect anaerobic conditions can be assured. This latter point is extremely important because, if not carefully carried out, it will lead to endless failures. The whole apparatus is then placed in the incubator at 37.5° C. At the end of twenty-four, thirty-six, or forty-eight hours samples are taken (about 1 c.c. in quantity) from the observation tubes in order, starting from the one next the bulbous end, and then spread out on Conradi-Drigalski medium. These plates are then incubated at 37.5° C., and during the next twenty-four hours colon and typhoid bacilli will be revealed if present in the original inoculations.

Here I would call attention to another important fact, namely, that typhoid bacilli generally separate from colon bacilli under these conditions. The typhoid bacilli travel faster and farther than the colon bacilli, and usually show up one or two tubes ahead of the colon bacilli. In this manner I have always succeeded in obtaining the typhoid bacilli free from the colon bacilli within forty-eight hours.

A large number of observations have been made extending over many months, with mixtures containing all kinds of bacteria with which one meets, and which the laboratory stock could supply; in no case did I fail to obtain the colon and typhoid bacilli when present. When these two organisms were in minute quantities, as compared with other bacteria, the results were just as favorable.

When using mixtures containing many non-motile forms there was never the slightest difficulty in inducing the typhoid and colon bacilli to free themselves, and in order to put the scheme to severe practical tests, mixtures of all the common motile organisms were generally used.

The actual details of the very numerous experiments under these conditions need not be set forth here as they would only be wearisome to the reader, but as a final statement of the efficacy of this process, I must record the results of one or two experiments where the colon and typhoid bacilli were present only in minute quantities.

Common river water containing the usual varieties of bacteria, was inoculated with typhoid bacilli and from actual counts made the proportion of typhoid bacilli was 350 to the litre. From 50 c.c. of this water the typhoid bacilli were recovered by the process above described.

Colon bacilli were present in the proportion of one bacillus to 1 c.c. of water, and were easily recovered.

As already remarked, in using mixtures of colon and typhoid in minute quantities the typhoid always separated itself from the colon, but both have been recovered.

Having isolated the organisms in this way any confirmatory tests can be applied according to the wishes of the investigator.

In plating out from the experimental tube I have recommended the Conradi-Drigalski medium, and this I do because it offers a great advantage over ordinary agar, especially in the discrimination between typhoid and colon when present together; however, ordinary agar plates will give good results, but the difficulty of discriminating between typhoid and colon when present together on the same plate is much greater under these circumstances. Endo's medium is also a good one to use.

In commenting upon the process for the benefit of others I would give one or two hints regarding some of my failures. Occasionally I have found the ordinary motile organisms, and sometimes true aerobic ones, growing along the whole length of the tube, and in one or two exceptional instances even non-motile organisms. This I discovered to be due to my carelessness in handling the apparatus when putting it into, or taking it out of, the incubator. I found that by turning around quickly with the apparatus in my hands I set up distinct currents of a swirling character inside the tube, and thus brought about a mixing of the contents, which I did not desire. Again, subjecting the apparatus to different degrees of temperature, needlessly repeated, also sets up convection currents, which sometimes interfere with perfect working. Having put the apparatus in the incubator there is no necessity to take it out until one is actually about to take samples at the end of thirty-six or forty-eight hours, so that one disturbs it only once. If these words of caution are attended to, and these experiments carried out as I have described, I can guarantee successful results to anyone who wishes to investigate them for himself.

Before concluding I should like to add a few words with reference to its application to the bacteriological examination of water. The presence of colon, and perhaps typhoid, bacilli can be demonstrated if they are sufficiently numerous, by direct inoculation with 1, 5, or even 10 c.c. of water. If one wishes to test larger quantities of water for the presence of these two organisms then some process of concentration must be adopted.

Personally I use the well-known one of filtering through a Berkefeld filter, then brushing the organisms into a given quantity of broth or water and inoculating varying quantities of this concentrated mixture, which represents different amounts of original water. I have had extremely good results with this method of isolation when testing samples of natural drinking waters containing a few colon bacilli. Up to the present I have never had the good fortune to come across a sample of natural drinking water contaminated with typhoid, but from the experiments enumerated above, in which I inoculated drinking water with typhoid bacilli in the same proportion as one would expect under natural conditions, I was able to isolate them,

and there is good reason to suppose that were we dealing with a natural water also contaminated with typhoid the outcome would be equally successful.

REPORT OF AN EPITHELIAL LINED FISTULA-IN-ANO IN AN INFANT.

By MARTIN W. WARE, M.D.,

SURGEON TO THE GOOD SAMARITAN DISPENSARY; ADJUNCT SURGEON TO THE GENITOURINARY
DEPARTMENT OF MT. SINAI HOSPITAL, NEW YORK.

THE special treatises on diseases of the rectum and anus bear witness to the relative scarcity of the fistula-in-ano during infancy, and such cases as are recorded are, from a pathological standpoint, placed in the same category as those encountered in the adult and attributed to like etiological factors, conspicuously tuberculosis.

A number of times I have encountered this condition in infancy and childhood and three times in nurslings. The treatment of these fistulae calls for radical procedures—division and excision. In their tendency to recur they also partake of the features peculiar to the fistulae of adolescence.

That tuberculosis alone is not responsible for this lesion the report of the following case suffices:

A male breast-fed infant, aged three months, was brought by its mother, who directed attention to a constant discharge of moisture and feces from a small opening near the anus. Examination: Within one centimetre of the anus there was to be seen a minute opening without any areola or infiltration which betrayed signs of previous inflammation. A No. 1 Bowman probe easily entered the fistula, and its free end, after passing upward for a distance of 1.5 cm., was to be felt by the finger introduced into the rectum, just beyond the internal sphincter. No blood whatsoever appeared after this manipulation.

Operation. Following the usual preliminary preparation, and under an ethyl-chloride narcosis, the sphincter was stretched and the fistulous tract divided on a grooved director. It could be seen that the entire tract was lined with a delicate epithelial membrane easily movable over the underlying soft parts. It was excised and the wound allowed to heal by granulation. Complete healing set in within two weeks, and was attended with restoration of the sphincter.

Microscopic examination of the membrane showed structures peculiar to the skin or mucous membrane. There were several superimposed layers of epithelium; those on the surface stratified the deeper ones cylindrical; the papillae not so marked. The

cellular tissue beneath was normal and free from the cellular infiltration characteristic of inflammation.

Chiari,¹ in 1878, directed attention to the fact that in 800 cases examined on the postmortem table he found great variability in the depth of the lacunae Morgagni, amounting to actual diverticula at times. In five instances a fistula was continuous with these diverticula. He regarded these diverticula within the grasp of the sphincter due to pressure from within the bowel, similar to the pressure diverticula of the pharynx in distinction to the traction diverticula. A traction diverticulum would lie beyond the grasp of the sphincter and be brought about by the contraction of a cicatrix adherent to the bowel.

Graser² has called attention to diverticula of the large intestine, due to deficiency in the muscular wall, in consequence of chronic congestion of the mesenteric vessels; so it is not unlikely that the varicose condition of the veins in the rectum may be a like factor in determining the diverticula.

Meissel³ reports two cases of fistula-in-ano in adults in which the tract was lined with epithelium. He regards both of these cases as due to diverticula in the sense pointed out by Chiari.

Neumann⁴ reports a pararectal pouch filled with feces. This he attributes to some faulty union of the bowel with the cloaca.

The fistula-in-ano of the infant herein reported I believe can best be explained on a congenital basis, due to inclusion of the skin at the time of fusion of the structures. An analogous condition is met with in the case of some of the paraurethral passages.

While relatively rare, it is deemed worthy to direct attention to this variety of fistula, the persistence of which is inevitable unless the entire epithelial tract be excised.

¹ Ueber der Analen Divertikel der Rektalenschleimbant u. Ihre Beziehungen zu den Analfisteln, Wiener medizinisch. Jahrbuch, 1878.

² Ueber Multiple Darmdivertikel in der Flexura Sigmoides, Muenchener medizinische Wochenschrift, 1899, S. 721.

³ Ueber Epithelbekleidete Analfisteln, Bruns, Beitrage z. klinischen Chirurgie, vol. xxviii, p. 293, 1900.

⁴ Deutsche medizinische Wochenschrift, 1896, p. 159.

THE ADVISABILITY OF ELIMINATING THE TERMS MENIERE'S DISEASE AND MENIERE'S SYMPTOMS FROM OTOLOGIC NOMENCLATURE.*

BY EMIL AMBERG, M.D.,

DETROIT, MICHIGAN.

MENIERE described the following case:¹ "A young girl during menstruation acquired a heavy cold while riding in the night on the imperial of a coach. She suddenly vomited, became dizzy, and deaf in both ears. On the fifth day she died. The autopsy revealed that no changes had taken place in the brain or in the spinal cord. The semicircular canals, however, were filled with a red, plastic, blood-like exudation, of which scarcely any traces were discovered in the vestibule and none of which was found in the cochlea." Ménière became convinced that the disease which he described did not emanate from the brain but from the ear. In a communication to the Academy he draws the following conclusions from his observations.²

1. A hearing organ hitherto entirely well can suddenly become the seat of functional disturbances consisting of various continuous or intermittent subjective noises with which, soon, a more or less great decrease of hearing is associated.

2. These functional disturbances are located in the inner ear and can cause attacks coming seemingly from the brain, namely, vertigo, feeling of being stunned, staggering gait, turning motion, and sudden collapse; furthermore, they are accompanied by nausea, vomiting, and syncope-like condition.

3. These attacks, which repeat themselves after free intervals, are invariably followed by a mostly grave diminution of hearing, and frequently the hearing is destroyed suddenly and completely.

4. All this leads to the supposition that the material cause of these functional disturbances is located in the semicircular canals.

The disease causing hardness of hearing, tinnitus and vertigo was named "Ménière's disease." Soon it was detected that hardness of hearing, tinnitus, and vertigo in various degrees were found in a number of instances for which the term "Ménière's disease" could not be employed, because the patients did not present the clinical entity described before, nor did the symptoms make it probable that the pathologic findings would correspond to those in Ménière's patient. In order to accommodate these cases in regard to the terminology the term Ménière's (complex of) symptoms was introduced. It did not take long for a discussion to arise as to the proper appli-

* Read before the First Councillor District Medical Society, Ann Arbor, Michigan, December 22, 1905.

cation of either term. That the abundance of observations suggested that even these two terms would not be sufficient to cover the whole group of diseases which were now recognized as representatives of an important array of afflictions led to further concessions in terminology. Ménière had entered a dark corner; he discovered and illuminated the entrance of a recess in medicine, so to speak; but the light of this one man was extinguished before he could discover the great extension and the many ramifications of the territory which are by no means all known to-day.

The literature on the subject is voluminous. I quote only a few pertinent remarks.

Eitelberg³ says: "And even in the apoplectic form it is not established with certainty that the pathologic conditions shown by Ménière must be the cause of the same, because the disease ends fatally only in extremely rare cases." . . . "Besides, those attacks frequently pass by very quickly, whereas the resorption of an exudate must take a much longer time. Furthermore, one has repeatedly found that a catarrhal affection of the middle ear, with or without exudate, can be the cause of Ménière's symptoms, even if they appear suddenly. These symptoms have been observed to disappear as soon as the middle-ear catarrh had been improved or cured. In these cases we are more inclined to think of a momentary irritation of the acoustic nerve through increased labyrinthian pressure, or to think more of a reflex causation, than of an apoplectic exudate into the semicircular canals. It would be necessary also to eliminate these cases if we would be so very particular about the definition. In view of the fact, however, that Ménière himself was acquainted with the relation of the middle-ear affections and the symptoms mentioned before, we shall not pass judgment so severely on the definition of Ménière's disease and will allow it to stand even there where only the most important symptoms appear, namely, sudden and violent vertigo, with nausea and vomiting, after the other symptoms, namely, hardness of hearing and tinnitus, have already existed for some time."

I cannot agree with this view. Since Ménière's publication a variety of similar clinical pictures have been described and we are obliged to discriminate more correctly. We learn that affections of the labyrinth, with tinnitus, hardness of hearing, vertigo, etc., can be caused¹ "by anemia, narrowing and embolism of the *arteria auditiva interna* or of the *arteria basilaris* (in consequence of compression by tumors or aneurisms or endarteritis chronica), by angioneurosis and free gas bubbles in the labyrinthian vessels in consequence of too rapid decompression in people working in caissons, and in divers. Furthermore, we find the symptoms mentioned before in hemorrhages caused by fractures of the temporal bone, in diseases of the cerebrum and its coverings, through changes in the walls of the bloodvessels (in syphilis, nephritis, leukamia, diabetes mellitus, atheromatosis, heart lesions), and in middle-ear suppurations."

Alt⁵ says that the local symptoms mentioned can be found also in infectious diseases. "In the latter the middle ear need not necessarily be affected. In rare cases hemorrhages can be caused by sudden increase of pressure in the outer ear canal. In an abortive form of cerebrospinal meningitis the inner ear can be affected, showing fever, headaches, vomiting, convulsions, etc., leaving behind them total deafness and staggering gait. Secondary inflammation of the labyrinth can lead to new formation of connective tissue. This tissue can take up salts or be transformed into bone. Concussion of the labyrinth may result in hardness of hearing and tinnitus."

Tuberculosis⁶ of the labyrinth can cause deafness, tinnitus, and vertigo.

Whether similar disturbances occur in the status lymphaticus is not known to me. Theoretically, at least, they appear probable. Albert P. Ohlmacher⁷ mentions conditions which are closely related to those in which disturbances of the inner ear have been found. He says: "Hypertrophy of the brain is mentioned by Rokitsansky as one of the features of status lymphaticus, at times combined with cerebral oedema or with widening of the ventricles and increase of intracerebral fluid. In some of the recently studied cases one or more of these conditions are mentioned, and, in certain epileptics in the lymphatic state, general cerebral hypertrophy, localized hypertrophy, oedema, or hydrocephalus may appear." . . . "Again, one may find status lymphaticus associated with certain other diseases and their anatomical changes, as, for example, Basedow's disease, struma, scrofula, and pseudoleukemia."

Dr. T. Wilson Parry⁸ mentions that besides numerous general and special text-books he had before him two hundred and sixty papers referring to Ménière's symptoms. He defines three pathological conditions which should be considered:

1. An acute exudation or sudden hemorrhage into the labyrinth (a true Ménière's disease).
2. Chronic labyrinthian lesion not due to the above causes.
3. Secondary labyrinthian sources of irritation which are chiefly of tympanic origin.

He says: "If the one essential characteristic of true Ménière's disease not supervening on a previous disease be labyrinthian apoplexy then these are all undoubted cases of true Ménière's disease, for the microscope clearly reveals the perilymphatic space between the membranes and osseous semicircular canals completely filled up with an effusion of blood, some of which has been organized into newly formed bone."

"Excessive mechanical pressure thus induced acting upon the vestibular nerve endings produces an irritation which provokes the urgent consciousness of disordered equilibration. The symptoms of tinnitus (positive) and deafness (negative) are auditory phenomena, and are due to irritation and loss of function, respectively, of the

cochlear branch of the auditory nerve. This "auditory" nerve travels to the nucleus accessorius, thence as auditory fibres along the striæ acusticæ, and, ascending in the lemniscus passes upward to the cerebrum without the intermediation of the cerebellum, to which the equilibrial fibres eventually find their way." Speaking of extralabyrinthian causes, Parry refers the effects of retracted and ankylosed ossicles to the spasmodic condition of the tensor tympani muscle or paralysis of the stapedius. He quotes a case described by Politzer in which a bony growth on the external labyrinthian wall had grown over the foramen ovale and was united to the stapes, producing symptoms of the true Ménière's disease.

The attacks caused by syringing the ear, by the pressure caused by cerumen and by thermal irritations, are well known.

The whole picture becomes complicated when we consider that the so-called Ménière's symptoms can be caused by an angioneurosis. Brunner⁹ says: "There must be mentioned an observation by Scanzoni (transitory deafness with general irritation of the vessels and symptoms of urticaria after application of leeches to the vaginal region)." This must, perhaps, be taken as a reflex angiospasmus (or angioparalysis) of the labyrinthian vessels.

Brunner quotes a case of Politzer, classified as angioneurotic paralysis of the acusticus, in which galvanization of the sympathicus of the neck made the attacks of vertigo, marked hardness of hearing and tinnitus disappear.

Whether we have a condition before us which resembles somewhat the still questionable relation between the sympathicus and glaucoma I should like only to hint at.

Parry¹⁰ relates a case in which the application of a seton had a very beneficial effect. He says: "The reasons that I have such full faith in the seton, after drugs have been found to be of no avail, are the following: . . . I believe that it acts reflexly on the vasomotor system by means of the sympathetic, so as to cause constriction of the vessels in the vicinity of the lesion," etc. . . .

Frankl-Hochwart, in his monograph (*Der Ménièresche Symptomen Complex; Die Erkrankungen des inneren Ohres*, Wien, 1898; Alfred Hoelder) gives a detailed classification of the kindred affections and mentions (page 30) pseudo-Ménière's attacks in hysteria, as epileptic aura, and in hemieramia.

In regard to vertigo, Wundt¹¹ says: "Vertigo can usually be created in two ways: first, through the disturbance of function of certain peripheral organs of sense, the impression of which causes the appearance of those sensations which create the perception of the static equilibrium of the body during rest and motion; and second, through central disturbances of function, which are apt to change in any manner whatsoever the normal relation between the impressions of our senses and the motions or perceptions of motions. With an organ of sense of the first variety we shall become acquainted in

the ampullæ and in the semicircular canals of the labyrinth of the ear. Compared herewith the cerebrum seems to be that central organ of which the experimental or pathological changes cause, most frequently, objective or subjective symptoms of vertigo through central causes. On account of the close neighborhood of the labyrinth to this central organ it can be understood that both forms of disturbance of equilibrium, the one caused peripherally and the other caused centrally through affections of the cerebellum, can frequently not easily be separated."

He further remarks:¹² "The disturbed function of a peripheral organ of sense or of a central region can produce sensations of vertigo only in that manner, that the normal co-ordination of the impressions of the senses to the movements of the body is injured in some manner. In fact, it can easily be seen that the creation of vertigo can always be referred to this general condition, when we find as its cause subjective or objective reasons. For this reason its occurrence in single instances can be caused in a manifold manner, centrally as well as peripherally. The inexperienced becomes dizzy when he walks on the ice. The uncertainty of vision, as it occurs in the amblyopic, or strabismic, or in a person with normal vision when he covers up one of his eyes, is not infrequently accompanied by dizziness. Still more plainly we see it occur in the walk of those in whom the degeneration of the posterior columns of the spinal cord dulls or abolishes the sensation of touch. The patient does not feel as he used to the existence of the ground, and he loses his equilibrium, he staggers and tries to save himself from falling down, by balancing with his arms."

The conclusions to be drawn from these observations are plain and correspond with the stand taken by E. P. Lyon,¹³ who says: "Throughout my experimental work I have tried to adhere to the following rules:

"1. If stimulation of a sense organ or part of the nervous system calls forth a certain reaction (motion) it is certain that the stimulated organ is connected by nerves with the centre of this motion, but not that the stimulated organ itself is the centre.

"2. If through extirpation of an organ a function is eliminated it is certain that the extirpated organ is connected by nerves with the centre of this function, but not that it is itself the centre.

"3. If after extirpation of an organ an organic function which ordinarily is lost after this extirpation remains *in one case only* it is certain that the extirpated organ is not the sole centre of this function."

Landois¹⁴ says: "Strange to say, we find sometimes in chronic affections of the stomach inclination to attacks of vertigo (Trousseau's stomach vertigo). It is, perhaps, created by an irritation of the nerves of the vessels of the labyrinth through an irritation of the nerves of the stomach. This would influence the pressure condi-

tions of the endolymph. In an analogous manner an 'intestinal vertigo' (Leube), a 'larynx vertigo' (Charcot), and a 'urethral vertigo' (Erlenmeyer) have been described."

Wagenhaeuser¹⁵ says: "We must mention under the head of vertigo caused by reflex the observations in which the symptoms showed themselves under the influence of strong or strictly identified sound impressions. Schmidekam mentions in this connection the strong tone of a siren; Roosa, Ely, Jacobson, high tones; Bechterew ringing of bells and rolling of a carriage; v. Frankl-Hochwart the 'Tarnhelm' motive in R. Wagner's "Götterdämmerung." Of interest is another patient of this author, who became violently dizzy during the Weber's test with the C-fork, and only when this fork was used. Ménière's symptoms caused by poison are repeatedly mentioned in the literature. Sapolini observed thirteen causes in which the symptoms appeared when a hair-dye with nitrate of silver was used and disappeared when the dye was discontinued; furthermore, Haug accuses mushrooms, Woakes, nicotine."

Alt (quoted by Wagenhaeuser) gives the anatomical basis for a case of morbus Ménière in which a leukæmic infiltration of the acoustic nerve was found, whereas the middle ear and the labyrinth were intact.

Wagenhaeuser quotes Siebenmann's interesting findings in multiple spongification of the labyrinthian capsule: "The author (Siebenmann) calls attention to the close approach of extreme spongy spaces to the endosteum of the labyrinth, where the mighty lymph spaces of the newly formed spongiosa appear to be separated from the perilymph of the labyrinth only by thin membranes. Through these changes the pressure and density of the labyrinthian fluid could not only be subjected to an alteration in consequence of processes of diffusion, but some portions of the specimens proved clearly that the separating wall between the two lymph systems, which is now reduced to a membrane of connective tissue, can also be resorbed, whereby perforations develop with sudden changes in the intralabyrinthian pressure and intralabyrinthian position." Wagenhaeuser (*loc. cit.*) mentions that in the ear clinic in Tübingen as predisposing causes for morbus Ménière are mentioned leukemia, lues, and tabes, effects of great sunheat and mental overexertion.

Frankl-Hochwart¹⁶ speaks of the labyrinth affections caused by toxic diseases. He mentions parotitis (Politzer), which very frequently is combined with scarlatina nephritis; he speaks of parotitis, typhus abdominalis and exanthematicus, variola, measles and influenza, cerebrospinal meningitis, quinine and salicylic acid, antipyrin, antifebrin (Haug), chloroform (Moos and Haug), chenopodium (North), atropine (Haug), hydrargyrum (Wolf), marsh gas, coal gas, illuminating gas.

O. Wolf,¹⁷ speaking of deafness in consequence of lead poisoning (surditas saturnina), says that when the ear is affected, vertigo,

tinnitus, and more or less rapid decrease of hearing appear. He quotes Tanquerel, who found in lead poisoning an induration of the ganglia of the neck, and Kussmaul and Meyer, who could demonstrate an increase and sclerosis of the connective tissue in the ganglion cœliacum in the autopsy of a man who died immediately after an attack of colic with severe enteric symptoms.

Frankl-Hochwart¹⁸ mentions nephritis, pernicious anemia, morbus maculosus hemorrhagicus Werlhofii. While changes in the inner ear are rather rare in these affections, he mentions that nervous deafness is not infrequently found in leukæmia. Marasmus is also cited as one of the causes of affections of the inner ear. Atrophy of the labyrinth is described, as he says, by Voltolini, Toynbee, and Habermann.

Parry¹⁹ mentions a case which in my mind forms the one extreme in the most varied conditions to which the term Ménière's disease has been applied. He says: "I have pleasure in being able to place before you a case of Ménière's disease, the new treatment of which, namely, hypnotic suggestion, has been entirely satisfactory. So far as I am aware, it is the first case in London treated in this way; and even in Paris, the home of hypnotism, one has not read of any cases that have been treated by this new method. The honor of recommending this treatment and carrying the case to a most successful issue is entirely due to Dr. A. Ernest Jones, of University College Hospital. The brilliant result, as will be seen from the full notes adjoined to this article, far exceeded our most sanguine expectation. The picture of the cure of a man of forty-four years, who had become prematurely old from constant worrying and depressing effects of eight years' unbearable tinnitus, vertigo, and vomiting is vivid enough without further comment."

Wagenhaeuser²⁰ says: "A look into the literature lets us recognize the lack of uniformity, the veritably confusing condition which is prevalent in this respect. The same 'Ménière's disease' which had been accepted for the disease described by Ménière was extended soon to all processes with symptoms of vertigo, tinnitus, and more or less outspoken hardness of hearing. . . ."

"Also Knapp, Politzer and others brought prominently forward the fact that two different conditions are united under this name, and they proposed to name only the suddenly appearing apoplectic-like deafness which shows itself with the characteristic symptoms 'Ménière's disease morbus Ménière,' whereas the name 'Ménière's vertigo, Ménière's symptoms,' should be used for all other disturbances of hearing which are combined with subjective noises and vertigo. Again, others, following Brunner's proposition, abandon entirely the name 'Ménière's disease' and want to have used, only very generally, the term 'vertigo Ménière,' Ménière's complex of symptoms."

In a monograph²¹ Brunner says: "One should speak of Ménière's symptoms only if the attacks of vertigo come spontaneously without

external influences and if they come suddenly, mostly in repeated attacks, without fever, with more or less violent noises and rapid or only gradual appearance of hardness of hearing, and by and by one has become accustomed to speak of any vertigo with nausea and vomiting originating from the ear as Ménière's vertigo, Ménière's symptoms, and one has gradually admitted the same to be created—

"1. Through influences from the external and middle ear;

"2. Through diseases of the labyrinth;

"3. Through diseases of the brain and of the acoustic nerve; and

"4. Through neurosis, *e. g.*, of the sympathicus (angioneurosis)."

We do not speak nowadays of heart disease or of heart symptoms, of lung disease or of lung symptoms, nor of kidney disease or of kidney symptoms. We are expected to diagnose and name a recognizable affection of these organs more definitely, and if this is impossible, in some instances, we leave the question open with the understanding that further investigation is required to clear up some dark points. The same rule, I think, should be followed in otitis interna.

CONCLUSIONS. 1. The triad: Hardness of hearing, vertigo, and tinnitus is given as constituting the functional disturbance observed in the so-called Ménière's disease.

2. These symptoms occur also in numerous affections which are not based on the pathological finding as described by Ménière in his historical case.

3. The observation that not always a typical picture is present has led to the introduction of other terms, such as "Ménière's symptoms," etc., which has proved to be confusing.

4. Even affections of the middle ear, of the outer ear, or of other parts of the body can cause the symptoms described by Ménière.

5. These latter causes can be diagnosed in many instances and prove the existence of a great group of affections characterized by functional disturbances of the inner ear.

6. By abandoning the terms "Ménière's disease" and "Ménière's symptoms" a more definite nomenclature can be introduced. This is important not only from a physiological and pathological, but also from a clinical standpoint. By using, for instance, the terms "otitis interna syphilitica," or "leukemica," or "angioneurotica," or "gastrica" a clearer conception of some affections would ensue.

7. The various terms should be agreed upon. The many international medical meetings give ample opportunity for such a procedure.

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21. See reference 9, p. 281.

REVIEWS.

THERAPEUTICS: ITS PRINCIPLES AND PRACTICE. By HORATIO C. WOOD, M.D., and HORATIO C. WOOD, JR., M.D. Twelfth edition. Philadelphia and London: J. B. Lippincott Co., 1905.

THE reappearance of this old friend in its successive editions is always pleasant, even though this last one is very different from the book from which many of us studied in former days. The changes have been brought about partly by the radical alterations in the new Pharmacopœia, and partly by the recognition that a text-book is not always a ready book of reference for the practitioner. The association of H. C. Wood, Jr., with his father, has doubtless been of help in the thorough revision of the work, which places it on a plane as high and modern as any book of the day dealing with drug therapeutics.

The authors have retained the old classification of drugs according to their physiological actions. The chapters on expectorants and disinfectants have been rewritten and a new classification of these drugs adopted. There is also a detailed consideration of local anæsthesia, including the so-called spinal and neural anæsthesia. Over seventy new drugs have been added, making the part of the work dealing with materia medica quite as thorough as needful.

The discussion of the newer drugs, such as aspirin, argyrol, urotropin and many others, are satisfying both to the scientist and the practitioner. Especially admirable are the sections upon Gelatin as a Hemostatic and the Therapeutics of Adrenalin. It may strike one as peculiar to see the various serums and extracts of organs classed under the alteratives, though in the classification adopted this is doubtless their proper place. The chapters upon Cold and Heat and Electricity are up to their former high standard, but we miss a consideration of Hydrotherapy, Lavage, Hypodermoclysis, Venesection, the Nauheim Treatment, and other remedial measures not medicinal. With these exceptions the work seems complete, as far as one which lays especial emphasis upon drugs can be in the present age, when, on the one hand, climatic and dietetic treatment is claiming so much attention; and, on the other, surgery is becoming a more and more intimate co-worker with medicine. However, there is much work left for drugs to do, and doubtless we are in danger of allowing the pendulum to swing too far away from the lights of our forefathers. The treatise is intended as a text-book for stu-

dents and as a book of reference for practitioners. A great help for the former are the new summaries of physiological actions of the various drugs. An alphabetical list of diseases with page reference to the remedies used in their treatment, is a needed innovation which makes the volume of much practical use as a reference book of treatment. A complete and systematic bibliography appended to each section adds much to the scientific value of the book. In its type and binding the volume closely resembles the previous editions.

J. D. S.

THE DIAGNOSIS OF DISEASES OF WOMEN. A TREATISE FOR STUDENTS AND PRACTITIONERS. BY PALMER FINDLEY, B.S., M.D. Second edition, revised and enlarged. Philadelphia and New York: Lea Brothers & Co., 1905.

To the many who have known this book in its earlier edition it will be only necessary to say that by the inclusion of new material it has been brought thoroughly up to date. New chapters have been added upon blood and also bacteriological examinations.

The intent of the volume is to supply the English reader with a book which will fill the place of Winter's *Gynäkologische Diagnostik*, by presenting the question of gynecological diagnosis in a more complete and detailed manner than is possible in volumes devoted to the consideration of gynecology as a whole.

The subject-matter of the work is divided into three parts: the first dealing with what the author calls General Diagnosis, and including the consideration of the clinical history, the physical examination, the uses of the various instruments employed in making a diagnosis, as the vaginal speculum, the uterine sound, and tenaculum forceps; and also chapters upon the Microscopic Examination of Scrapings and Excised Pieces, Examination of the Blood, and Bacteriological Examinations. The second portion is devoted to Special Diagnosis, and consists in a detailed consideration of the whole subject of gynecological disease viewed from the standpoint of diagnosis. The first chapter is concerned with the diagnosis of pregnancy and is in every way complete. It is difficult to pick out any particular chapters for the purposes of comment, since the general excellence is so marked, but we think that those upon the diagnosis of chorioepithelioma malignum, ectopic pregnancy, and diseases of the ovary are particularly good.

The author has enhanced the value of the book and also aided the students to grasp the subject by including, to some extent, the indications for treatment, as these are explained by the pathology of the various processes.

The third section of the book takes up the diseases of the urinary system and includes the consideration of the ureters, urethra, kidneys, bladder, and the question of the abnormalities associated with micturition.

The illustrations are especially good and particularly well chosen and executed, while the printing and binding are both of the standard of excellence set by the publishers.

W. R. N.

FOOD AND DIET IN HEALTH AND DISEASE. By ROBERT F. WILLIAMS, A.M., M.D. Philadelphia and New York: Lea Brothers & Co., 1906.

THIS book is for the intelligent housewife as well as for physicians and nurses, and presents the essentials of the purely scientific part of the subject of dietetics in a form intelligible to any one who has had the most ordinary advantages in the way of education. Whenever possible full explanations are given for known physiological facts and for generally accepted principles of diet in health and the nursing and feeding of the sick. The introductory remarks to the various subjects in each instance contain a concise statement of the principles on which the best medical practice is based, without unnecessary discussion of the differences in prevailing views. Certain questions of special interest, however, receive full consideration, as, for example, the food value of alcohol in health and in disease. The author's views may be epitomized in his own words: "If (alcohol is) a food, it is one which has no advantage over many other food substances, and is, therefore, never necessary for food purposes." He holds the view that alcohol is at no time a true stimulant, and that the apparent stimulation of heart and brain is due to the fact that the depressing action of the drug manifests itself first on the higher centres. By depressing the inhibitory cells of the brain, restraint is removed and control lessened, so that the heart acts more rapidly and more vigorously (in part also on account of the vasomotor relaxation in the peripheral vessels), the imagination is more active and speech flows more readily because the customary self-restraint is relaxed. Its use is, therefore, never necessary in health, and in disease the same effects can be as well obtained by other means. Although scientific evidence for such views seems to exist, most practitioners will be loth to adopt them in their practice or consent to dispense with alcohol in the treatment of their fever patients.

A great deal of valuable and necessary information is stowed away compactly in tables, most of which are taken from reports of the Experiment Station of the U. S. Department of Agriculture, on which the matter relating to different foodstuffs and their relative nutri-

tional value, contained in Part I, is chiefly based. The chapters on cooking and on the different kinds of food are very interesting reading.

In Part II, which more particularly interests the practitioner, the author displays a conservative adherence to the generally accepted principles of practice, notably in the chapter on typhoid fever, which is taken as the type of an infectious disease. The newer method of so-called "solid feeding," which is now advocated by some leading clinicians, is dismissed with the non-committal statement that as the evidence of the greater comfort and somewhat lower mortality among patients who are allowed some solid food increases, "material alterations will soon prevail in professional opinions, concerning nutrition in typhoid." The dietetic directions for diarrhea in infants are in accord with the latest teaching, as is the treatment of infant feeding in general, in the first portion of the book. In the chapter on diabetes, the author reflects the views of Van Noorden and the present conservatism in the matter of restricting carbohydrates in this disease. Good honest bread made of wheat flour is reinstated and the much maligned Irish potato again finds a place on the list of permissible vegetables, the length of which should go far toward reviving the drooping spirits of the diabetic and lessening the perplexing labors of his medical attendant.

The arrangement of the subject matter and the quality of the style deserve special commendation, while the editorial work and proof-reading leave nothing to be desired. An incomplete idea of the book would be conveyed by omitting to mention the dietaries and recipes contained in the last chapter.

R. M. G.

THE MEDICAL DISEASES OF EGYPT. By F. M. SANDWITH, M.D., F.R.C.P., Consulting Physician to H. H. the Khedive and to Kasr-el-Ainy Hospital, Cairo; Lecturer at the London School of Tropical Medicine, etc. Part I. London: Henry Kimpton, 1905.

THE author in his preface states that while writing this book he has had in mind "the needs of three classes of possible readers—the Egyptian student of medicine, past and present, newly appointed English doctors who are suddenly placed in positions of responsibility in Egypt, without any knowledge of what sort of diseases they are likely to meet with among the natives, and the large and increasing number of colleagues in Europe and elsewhere who are interested in the behavior of medical diseases in foreign countries."

The book is intended not as a practice of medicine, but as a treatise on medicine as seen in Egypt; upon this subject the author

is especially qualified to write, for his twenty-one years' practical experience in Egypt gives him an intimate knowledge of disease as it exists in that country.

The present volume contains sections upon some of the infectious diseases. We presume, however, that there must be at least one more volume upon the infectious diseases, since in Part I there are no descriptions of such important conditions as tuberculosis, syphilis, pneumonia, malaria, and Asiatic cholera. Many of the affections that occur only occasionally in Egypt, among which it is surprising to find typhoid fever, are discussed with but a cursory notice. Reference is made to the larger text-books for full descriptions. More space is given to relapsing fever, infectious jaundice, and Mediterranean fever. At least one-half the book is devoted to discussions upon plague, bilharziasis, ankylostomiasis, and pellagra. These chapters are most interesting, not so much from the picture which the author gives of the disease as from the delightful and very full discussions upon the historical aspect, the epidemiology, and sociological problems concerned in their occurrence and presence in Egypt. His intimate knowledge of the works of Arabic physicians lends especial charm to the historical description.

To each chapter is appended a short bibliography covering at least many of the important papers upon the subject.

The arrangement of the book is bad. The two diseases bilharziasis and ankylostomiasis due to animal parasites scarcely follow in order after plague, while it is surprising to find pellagra considered among the definite infectious diseases. The book, however, is interesting and well written, serving to give a good idea of the prevalence and occurrence of certain diseases in Egypt. W. T. L.

PHYSICAL DIAGNOSIS, INCLUDING DISEASES OF THE THORACIC AND ABDOMINAL ORGANS. A MANUAL FOR STUDENTS AND PHYSICIANS. BY EGBERT LE FEVRE, M.D. Second edition. Philadelphia and New York: Lea Brothers & Co., 1905.

DR. LE FEVRE'S book, which now appears in its second edition, is already favorably known as a standard text-book on physical diagnosis, particularly adapted by its size and scope to the needs of students. One special feature which distinguishes this work from most others of similar scope is the large share of attention devoted to questions of physics and physiology, and to the way in which the phenomena observed in the chest are influenced by physical conditions and forces. The student is thus taught to reason rather than to memorize and, since he acquires an intelligent knowledge of the production and modification of physical signs, is also

better enabled to appreciate their significance. It might indeed be objected that there is a little too much of this kind of theoretical discussion for a book of this size, were it not for the great educational value of such mental exercises to the student of science, and the tendency observed in many of the shorter text-books to sacrifice theoretical discussion and explanation to the demands of brevity. Such secondary factors as the tension of tissues and the physical properties of the bony structure of the thoracic cage apart from its contents, which have an important influence in modifying the physical signs, are particularly well brought out. If a criticism be allowable where there is so much to commend, it might be suggested that one important phase of the science of physical diagnosis, which cannot be too strongly impressed on the student, is perhaps not sufficiently emphasized in the present work. It is the relative value of the different methods of physical examination under varying circumstances and for the detection of certain definite conditions. The traditional order in which the various methods are usually given—inspection, palpation, percussion, auscultation—is, we think, in part, at least, responsible for this failure to appreciate their relative value, particularly in practical work. While no one will deny the importance of the first three methods, it is nevertheless true that auscultation yields the greatest amount of useful information and is, on the whole, the method most generally available and the one on which we most rely. This is especially true in children, at least as compared with percussion, and in the early diagnosis of pulmonary tuberculosis, one of the most, if not the most, difficult problems in the whole range of physical diagnosis. The importance of a thorough proficiency in the use of the stethoscope for accuracy in diagnosis, especially in dealing with cardiac conditions, might also have been given greater prominence.

The second edition follows the same lines as the first and is brought up to date by the addition of an appendix on *x*-ray diagnosis, with many excellent illustrations of radiographs from cases of cardiac and pulmonary disease. No mention is made in this part of the book of the excellent work which has been done recently in short-time exposures of the chest with high-power tubes and which gives so much more satisfactory results than can be obtained with the fluoroscope.

R. M. G.

CLEFT PALATE AND HARELIP. BY W. ARBUTHNOT LANE, M.S., F.R.C.S., Surgeon to Guy's Hospital, and Senior Surgeon to the Hospital for Sick Children, Great Ormond Street, London. London: The Medical Publishing Co., Ltd., 1905.

THIS monograph consists of a resumé of the various papers which the author has contributed to the subject of cleft palate.

His experience has been large and his opinions deserve the careful consideration of all surgeons. The first half of this pamphlet is taken up in a consideration of the development of the bones and cavities of the face. The author shows very graphically by text and illustration the disfigurements of the face resulting from a want of proper development of these bones and cavities. The greatest stress is laid upon the necessity of the early closure of the cleft between the nose and mouth: without such early closure the nasopharynx and its adjacent cavities never reach their normal development. He recommends operation for cleft palate as soon after birth as possible, believing that the day after birth is the best time: it is claimed that at this time little blood is lost and the child has not been reduced in strength by poor nutrition, as is so apt to follow in cases of cleft palate. If a harelip exist it is repaired at the same time, or as soon after as possible, never before the repair of the cleft palate.

The author's operation, as is well known, consists in taking a flap of mucous membrane and periosteum from one side of the cleft and dovetailing it between the mucous membrane and periosteum on the opposite side. He states most emphatically that the dangers of this operation in early life are much less than after the child has reached the age of two or three years. It is also claimed that operations at this period interfere much less with the development of the teeth than those done later.

It is our personal belief that many cases of cleft palate can be cured without operative procedure of any kind or with but slight operative interference. We are certainly convinced that when an immediate operation is not done, as advised by Lane, the parents of the child should be carefully instructed in the method of compressing the two maxillary bones together. If this is done two or three times a day it is wonderful how the cleft can be gradually narrowed or entirely obliterated. In order to be successful, of course, this treatment must be carried out persistently and conscientiously.

J. H. G.

A TEXT-BOOK OF PHYSIOLOGY, NORMAL AND PATHOLOGICAL. FOR STUDENTS AND PRACTITIONERS OF MEDICINE. By WINFIELD S. HALL, Ph.D. (Leipsig), M.D. (Leipsig), Professor of Physiology, Northwestern University Medical School, etc. Second edition, revised and enlarged. Philadelphia and New York: Lea Brothers & Co., 1905.

IN this book of something less than eight hundred pages the author has placed before his readers a large amount of information. The sciences allied to physiology, *i. e.*, anatomy, physics, chemistry, and

pathology, are taken up in a much more systematic manner than is usual in works on physiology. Thus brief anatomical and physiological introductions are given before each chapter, and the latter parts of most of the chapters are devoted to a summary of the important pathological conditions found in the organs, the discussion of whose normal functions precedes. The reader is struck by the numerous divisions and subdivisions the author has used in his presentation. The work is not exhaustive, and owing to the brevity of the part dealing purely with physiology, some subjects receive less attention than they deserve, and it seems doubtful whether on this account the beginner would get at all times clear conceptions. The book, treating as it does allied subjects rather than confining itself to those of physiology alone, should find more use in the hands of the practitioner as a means of readily refreshing the memory than as a text-book for students, as the book does not follow the usual plan of instruction as taught in any one course in most medical schools. It is well printed and the illustrations are numerous and well chosen.

G. C. R.

THE READY REFERENCE HANDBOOK OF DISEASES OF THE SKIN.

By GEORGE THOMAS JACKSON, M.D., Chief of Clinic and Instructor in Dermatology, College of Physicians and Surgeons, New York; Consulting Dermatologist to the Presbyterian Hospital and to the New York Infirmary for Women and Children; Member of the American Dermatological Association and of the New York Dermatological Society. With ninety-one illustrations and three plates. Fifth edition, thoroughly revised. New York and Philadelphia: Lea Brothers & Co.

THIS new edition of Dr. Jackson's well-known manual of diseases of the skin contains a considerable number of new sections, almost all of which are devoted to the consideration of uncommon and, for the most part, only recently described affections. The term *tuberculide*, recently introduced by the French, and adopted by a considerable number of other writers to indicate a class of eruptions associated with, if not dependent upon, tuberculosis, is somewhat to our surprise omitted. The alphabetical arrangement of subjects is still employed, an arrangement which, while open to decided objection from a scientific point of view, is a very useful one in facilitating reference to any particular disease.

The additions to and alterations of the text bring the book well up to date, and it continues to be, as it has long been, one of the most useful among the smaller treatises, especially for the student.

M. B. H.

MINOR AND OPERATIVE SURGERY, INCLUDING BANDAGING. By HENRY R. WHARTON, M.D., Professor of Clinical Surgery in the Woman's Medical College of Pennsylvania; Surgeon to the Presbyterian Hospital and to the Children's Hospital; Consulting Surgeon to St. Christopher's Hospital, the Bryn Mawr Hospital, and Girard College; Fellow of the American Surgical Association. Sixth edition, enlarged and thoroughly revised. Philadelphia and New York: Lea Brothers & Co., 1905.

It will be observed that the title of this book has been somewhat changed in this new edition, which is the sixth. This was thought advisable by the author because of the introduction of chapters on the emergency operations, which it was deemed well to incorporate. Excepting for these additions the rest of the work is little changed.

This work has always been a very popular one, and this revision, which brings it quite up to date, will result in its holding the place which it has so well maintained in the past. J. H. G.

LABORATORY GUIDE IN EXPERIMENTAL PHARMACOLOGY. DIRECTIONS FOR THE COURSE GIVEN IN THE UNIVERSITY OF MICHIGAN. By CHARLES W. EDMUNDS, A.B., M.D., Instructor in Pharmacology in the University of Michigan, and ARTHUR R. CUSHNY, A.M., M.D., Professor of Pharmacology in the University College, London, and late Professor of Materia Medica and Therapeutics in the University of Michigan. Ann Arbor, Michigan: George Wahr, 1905.

This little volume is published primarily as a guide to the course in Experimental Pharmacology in the University of Michigan, and consists of over one hundred pages of text, interleaved for the purpose of notes by the student. There is first an explanation of the manner of preparing the armamentarium necessary for the experiments, with directions as to the anaesthetization of, and operation upon, the frog and some of the smaller mammals; this is followed by series of experiments on the chemistry of certain drugs, their solubilities, incompatibilities, and so forth. The hypnotics, chloral, sulphonal, and paraldehyde are considered and the effects of varying dosage on the frog noted. *Nux vomica* is treated in much the same way and its effect on the nervous system compared with that of *Thuja*. Like experiments with opium, curara, nicotine, caffeine and so on follow. Interspersed through the experiment on the various drugs are descriptions of such phar-

macological procedures as the making of pills and preparation of emulsions.

Although the book is purely a guide to the experiments described as its title states, yet it is far from uninteresting reading in itself. There are a number of cuts illustrative of the text. A. N.

INTERNATIONAL CLINICS. Edited by A. O. J. KELLY, A.M., M.D., Philadelphia, Pa. Vol. IV. Fifteenth series, 1906. Pages 312. Philadelphia and London: J. B. Lippincott Co., 1906.

GOTTHEIL presents a carefully thought over paper on psoriasis, taking a broad view on the subject. The original strength of the physiological saline solutions (0.75 instead of 0.9 per cent) is the method of choice and is supported by the arguments of Hallion and Camion. Gwyn offers a practical paper on the "Treatment of Some Chronic Gastric Disorders," based upon clinical reference, which shows that the statements of Deaver on page 116, "That the medical treatment of diseases of the stomach in man has been familiar for generations, and, as far as an unprejudiced surgeon can see, very few momentous changes have occurred in their medical treatment during this time," have by no means been borne out by facts. Too frequently the limited knowledge of a subject possessed by an author is assumed to be equal to that of an expert, particularly when some ill-digested but novel plans are proposed. Benedikt reviews the "Internal Use of Carbolic Acid" in a paper which is hardly in consonance with modern therapeutics. Psychotherapy receives brief attention from Ballet, solely with reference to some nervous disorders, in which it may prove of value. Hall has made a careful study of thirty patients suffering from empyema, with the result that while no new information is acquired the junior practitioner will find explanation for some of his failures. The decidedly rare "post-tissue suction" sign, indicating pulmonary excavation, is clearly expounded by King. We presume he intended to mention that the sound is more distinct if the cavity communicates with a bronchus. "Abdominal Palpation," by Thayer, is a plea for a more successful result, when the patient is in a special upright position; it is fully described and its advantages stated. Duckworth, without material addition to existing knowledge, offers a readable lecture on the "Later Stages of Cirrhosis of the Liver." Brown on the ever-interesting thyroid gland and the newer studies on the parathyroids clearly defines our existing knowledge. Malta fever, of increasing interest to clinicians, receives careful attention, particularly with reference to the symptomatology and differential diagnosis, at the hands of Craig. The paper by Deaver has been alluded to. While he presents a strong plea for mechanical treatment, at the end

the force of his argument is decidedly weakened by the suggestion that the best results are obtained by conference between physician and surgeon—in fact, just what the physician has always believed. In the remaining surgical papers much of interest can be found, and the field covered is broader than usual. Ectopic pregnancy and pelvic hæmatocoele are the subjects in obstetrics and gynecology by Ashby, Newell, and Lockyer. The final paper is on the “Medical Treatment of the Menopause,” by Wilcox. Jullien publishes favorable results of the use of “Calomel Injections in Optic Neuritis of Syphilitic Origin,” while pathology is well represented by Warthin, presenting an “Experimental Study of Roentgen Rays in Blood-forming Organs,” with practical reference to leukaemia, and by Simon, who has studied eosinophilia. Taken as a whole, this volume is indeed a mine of information to the practitioner; its field is broad and the personality of the various authors impressive. Most of its contents are well worthy of the permanent form in which the various articles appear.

R. W. W.

DIE PALPABLEN GEBILDE DES NORMALEN MENSCHLICHEN KÖRPERS UND DEREN METHODISCHE PALPATION. 1. Teil. Obere Extremität. By TOBY COHN, M.D. Berlin: S. Karger, 1905.

A PROTRACTED experience in massage convinced the author of the present work that the average physician is not sufficiently instructed in palpation and, being imperfectly familiar with the normal conditions as revealed by palpation, is not in a position to make the most of this useful method of examination in the practice of medicine. The work, of which the present volume is only a small part, is in effect a text-book of plastic anatomy, written from the viewpoint of the clinician instead of from the æsthetic standpoint, and therein differing from other text-books on the subject, which are designed for the use of artists. The upper extremity, which forms the subject of the present volume, is divided into fifteen regions. Each anatomical region is treated after a certain systematic manner: first, the boundaries and shape are described, then follows an enumeration of the structures contained in it: the integument, the muscles, bones, and finally the blood-vessels and nerves when these are palpable. The author confines himself strictly to normal conditions with only an occasional reference to such abnormalities as stiffened and tortuous arteries and the like. While the palpation of the arm no doubt affords excellent opportunities for practising this method of physical examination, the information gained in this particular region of the body is rather limited and of comparatively little value, particularly

to the internist, who will be more interested in the part devoted to the abdomen, when that portion of the work appears. It is to be regretted that the book is not more fully illustrated.

R. M. G.

INDIGESTION: THE DIAGNOSIS AND TREATMENT OF THE FUNCTIONAL DERANGEMENTS OF THE STOMACH. BY GEORGE HERSCHELL, M.D. Chicago: W. T. Keener & Co., 1905.

ONE of the most sensible works on gastric disorders that have appeared in recent years, combining accurate knowledge of stomach disorders with great common sense in the treatment thereof. Very few things in the country have been more overdone than the "treatment of gastric disorders," largely owing to the specializing tendency of the age, and it pleases one's senses to read a work in which the recognition of "gastric neurosis" is so clear.

Perhaps, on the other hand, a tendency to associate a host of minor nervous symptoms with gastric disorders should be condemned, or at least considered as not proven (page 39).

True indigestion itself is given first consideration, and one can readily perceive that it is with actual non-digesting of food that the author is dealing with. Its many causes and phases are carefully taken up, and for one who wishes a full account of a disorder, usually so casually treated, we heartily recommend Dr. Herschell's book.

The neuroses receive their share of attention in special chapters. As regards hyperacidity, it seems a new idea that pyloric spasm is a natural endeavor to prevent the pyloric acid stomach contents reaching the duodenum; the advocating of proteid food unreservedly in these cases does not agree with many authorities who claim that such a diet provokes and keeps up the condition. The author also condemns frequent feedings in this disorder, a dietary proceeding usually followed by most authorities.

Septic stumps of teeth get more credit than they deserve, it seems, as producers of gas and fermentation and gastric disorders, since the organisms usually show that pyorrhea alveolaris and such conditions are not remarkable for the amount of fermentation.

Gastric myasthenia is admirably discussed both as to diagnosis and treatment, especially intragastric administration of electricity, which seems almost a specific in many cases. Acute and chronic gout and mucomembranous colitis are definitely considered by the author as results of the chronic gastric condition. The application of the Weir Mitchell treatment to gastric myasthenia is unhesitatingly condemned, since the condition de-

mands local and dietetic treatment in addition to rest, and over-feeding would certainly aggravate.

Mrs. Rorer is outdone by the list of carefully described foods and their method of preparation which Dr. Herschell gives in the last chapter.

N. B. G.

BACTERIOLOGY AND SURGICAL TECHNIQUE FOR NURSES. By EMILY M. A. STONEY. Second edition, thoroughly revised and enlarged. By FREDERIC RICHARDSON, M.D., Illustrated. Philadelphia, New York, and London: W. B. Saunders & Co., 1905.

USEFUL in matter and attractive and serviceable in form the first edition of this book justified the expectation of succeeding issues. Revision, of which there was scant need, four new chapters, a glossary, and an increase by eighty of the total pages, is the feature of improvement in the second edition now under review.

The thirty line-drawings that illustrate the chapter on bandaging will clearly recall bandages taught by demonstration, but their failure to portray the steps of application render them inefficient to teach of themselves. In minor surgical procedures the instruction upon the use of heat and cold is lacking in essential details. An excellent epitome of obstetrical nursing as formulated by Dr. Hirst has the advantage of presentation in its original form. Hints upon the personal conduct of a nurse's life are in the main practical. The manual should prove serviceable not only to nurses but to hospital internes.

J. M. S.

PROGRESS
OF
MEDICAL SCIENCE.

MEDICINE.

UNDER THE CHARGE OF

WILLIAM OSLER, M.D.,

REGIUS PROFESSOR OF MEDICINE, OXFORD UNIVERSITY, ENGLAND

AND

W. S. THAYER, M.D.,

PROFESSOR OF CLINICAL MEDICINE, JOHNS HOPKINS UNIVERSITY, BALTIMORE, MARYLAND.

General Principles of the Therapeutic Inoculation of Bacterial Vaccines as Applied to the Treatment of Tuberculous Infections.—A. E. WRIGHT (*Lancet*, 1905, ii., 1598). In previous communications Wright has been able to show that the blood fluids play an important part in phagocytosis. Quite distinct from the lysins, the agglutinins, and the antitoxins he has found a fourth substance present which prepares foreign bodies before the leukocytes can take them up. The presence of this substance is very easily demonstrable. If we make a mixture of a bacterial emulsion of normal salt solution, and of blood corpuscles, thoroughly washed so as to be freed from all serum, and incubate the mixture for fifteen minutes and then place it upon a slide and stain, we find that none or at least only a few of the organisms have been taken up by the leukocytes. If, on the other hand, we use blood serum instead of normal salt solution, so that we have a mixture of bacterial emulsion of blood serum and of washed corpuscles, we will find that after fifteen minutes' inoculation a very active phagocytosis has taken place. These substances in the serum, which prepare the bacteria for ingestion, Wright calls opsonins. By simple variations of the above experiments it has been shown that their action is upon the bacteria and not upon the leukocytes; that before combination they are thermolabile, but when once united with the bacteria the opsonic effect persists after heating to 60° for a long period of time; that heated serum cannot be reactivated by the addition of normal serum, so that probably no complement-like body plays a part in its action; that the blood of various individuals varies considerably in its phagocytic power, but in this variation the

leukocyte is practically a uniform factor, the differences being due to the content of the serum in opsonins. Wright has also devised a method for estimating the amount of opsonic power in a given specimen of serum, and although the accuracy of the method has been questioned, he and his pupils claim for it constant and precise results even within narrow limits.

According to Wright's views on immunity there are two forms of bacterial infection: (*a*) bacterial infections in which the machinery of immunization is inactive, and (*b*) bacterial infections in which this machinery is called into action. In one class of infections the opsonic power with respect to the infecting micro-organism hardly varies from day to day, remaining always inferior to that of normal blood. In another class of infections the opsonic power is continually fluctuating, the range of variations being from far below to far above the normal. These two categories of infections correspond respectively to strictly localized and systemic infections. In the localized, the low opsonic index was probably present before the infection, in the general, the wide variations are caused by periodic activity of the machinery of immunization called into play by the varying discharge of bacterial elements into the blood. These differences are no doubt fundamental, one type leading rapidly to death or recovery, the other often going on a lifetime. By vaccines we supply in the latter artificially a stimulation of the apparatus of immunization.

Wright uses in a very interesting way the estimation of the opsonic index of the blood, to determine the dose of the bacterial vaccines to be used and the proper time for injections. Although the results here given have been worked out in a similar manner for other diseases we shall refer only to the treatment of tuberculosis. For the inoculations Koch's T. R. or new tuberculin, which is a ground-up bacillus emulsion, was used. After an inoculation of tuberculin the resistance as measured by the opsonic power of the serum abruptly drops, this negative phase being followed by a positive phase when the opsonic index rapidly rises to a point far above normal. From this height there is again a rather abrupt drop and then a slow and gradual decline to the base line, or in some instances the opsonic power remains for a very long period at a point a little above its position before the injection. If the inoculation be repeated during the negative phase there is a cumulative action so that the resistance is driven down and down, but Wright has not been able to produce a satisfactory cumulative positive phase by injecting while the opsonic curve is rising. Wright believes that it is not necessary to produce constitutional disturbances in order to set the immunization machinery into action and that the capacity of the organism for immunizing response is not limited, but that this apparatus is easily stimulated and easily fatigued and we must guard with great care the demands we make upon it. He believes he obtains maximal immunizing responses from doses of tuberculin corresponding to from 1000 to 1600 mg. of tubercle bacillus powder. If the negative phase be very well marked and tends to increase after each subsequent injection he thinks too large a dose is being given, whereas if the negative reaction becomes less intense after each injection he thinks the patient is making good progress. A second inoculation is undertaken only when the effects of the first have worn off.

This is a method we have at hand to increase the opsonins in the

blood stream, but, as has been shown in relation to other infections at the point of localized disease, the amount of protective substances is always less than in the general circulation. It seems evident that we could expect little benefit to a localized lesion if the serum in the general circulation possessed a low degree of resistance, but if its immunizing value be high, any method that would stimulate the local circulation and keep the area of infection bathed with a constantly renewed supply of lymph would be of marked value. Bullock has made the interesting observation that in a large number of lupus cases being treated by the Finsen rays, those who were doing well possessed a high opsonic index, those who were not improving, a low. Wright thinks the various methods of local treatment of tuberculous lesions, such as Finsen and α -rays, are useful only in improving local circulatory conditions and that they are probably of little value unless the serum has a high opsonic index.

The cases Wright has treated are principally skin and surgical tuberculosis. It would be too lengthy to view in detail his results, but he thinks they are encouraging and that his method is a very valuable addition to tuberculin therapy. By following the method carefully he believes many of the unsatisfactory results attending its use will be avoided.

The Importance of Syphilis of the Liver in the Diagnosis of Abdominal Tumors.—KÖNIG (*Berl. klin. Woch.*, 1905, xlii., 137) cites three cases of syphilis of the liver to point a lesson in the difficulties of diagnosis. The first case, a man aged twenty-two years, was admitted complaining that for two years he had had paroxysmal attacks of colicky pain in the epigastrium, usually relieved by vomiting. Four months before admission he had noticed a tender mass in the abdomen which had gradually increased in size and become very painful. There was no history of syphilis. On examination a rounded, very tender mass was found below and to the left of the ensiform process, probably connected with the left lobe of the liver. He had no fever. The symptoms being severe and the diagnosis uncertain laparotomy was performed. The stomach and intestines were found normal. The left lobe of the liver was enlarged, firm, and covered with numerous grayish, slightly elevated, hard nodules. Microscopic examination of one of these nodules removed for diagnosis proved it to be a gumma. Subsequent to the operation the development of an interstitial keratitis and a chorio-retinitis led to the diagnosis of hereditary lues.

The second case, a woman, aged twenty-eight years, had been treated in various hospitals for severe pain in the region of the stomach and liver. An enlarged liver and an abdominal tumor (kidney?) had been previously made out on the medical division. The upper portion of the abdomen was moderately distended by a large mass lying in the right hypochondriac and epigastric regions and extending to the navel. The great mobility of the tumor and its extension backward into the renal region left it a matter of doubt whether it arose from the liver or the kidney and what the nature of the tumor was. But the suspicion of its renal origin was so strong that at operation the abdomen was first opened in the lumbar region and finding the kidney normal, then in front. The mass thus exposed was as large as two fists and connected with the right lobe of the liver by a very much constricted base (Schnur-

lappen). Its surface was covered with round, slightly elevated, hard nodules, grayish red at the borders, with glistening-white retracted centres. The impulse to remove this lobe and so get rid of the growth was checked by finding similar masses over the rest of the liver. The patient recovered her health completely after inunction treatment.

The third patient who had previously been quite healthy, complained of having had pain in the region of the gall-bladder for four weeks with loss of appetite and slight emaciation. A mass was felt in the region of the gall-bladder leading to a probable diagnosis of gall-bladder disease. At operation a smooth rounded mass about the size of an egg was found at the free border of the liver connected with the right lobe. As the diagnosis still remained uncertain the mass was removed and on microscopic examination proved to be a gumma.

In the absence of a definite history of syphilis the diagnosis in such cases becomes very difficult. There are two forms of syphilis of the liver in which tumors may occur: a diffuse interstitial hepatitis in which irregular bands of connective tissue by contracting may leave prominent masses of liver substance often connected with the main lobe by narrow bands (*Gestieltenlappen*) and *gunmata*. These two processes are frequently combined. The *Gestieltenlappen* may, as in the second case, be fairly independent and freely movable and often give one the impression of being kidney or gall-bladder tumors. *Gummata* are as a rule distinguishable as tumors within the substance of the liver itself. Considering the difficulty of diagnosis many of these tumors must come to operation—when carcinoma, tuberculosis, and sarcoma must be considered. If after the diagnosis of syphilis has been definitely made should the operator proceed to remove the diseased portion or sew up the wound and put the patient on antisymphilitic treatment? This question remains open. König thinks each case must be decided on its own merits. If the tumor can be easily removed, as in his third case, he believes it is often best to excise it.

Diabetes Insipidus and other Polyurias.—Although diabetes insipidus has been given a place as a distinct disease its definition remains obscure and unsatisfactory. It rests practically upon a single symptom whose etiology and pathology are not understood. It has been much discussed whether polydipsia or polyuria is the primary condition. It seems almost certain that some cases of hysterical origin do depend upon a primary polydipsia and it has been difficult to distinguish these from cases of polyuria. Whether the patient with diabetes insipidus retains water longer than the normal individual or passes it more quickly is still a discussed point. Buttersack considers tachyuria a sign of primary polydipsia. Observations purporting to show a continuous increase in the amount of urea and solids excreted would, if sustained, place the disease among the disorders of metabolism. The mass of available evidence, however, speaks against there being any change in metabolic function. The question of greatest interest, do the kidneys in diabetes insipidus functionate the same as normal kidneys, has not been satisfactorily answered.

Much light is shed upon all of these points by the investigations of MEYERS (*Deutsch. Arch. f. klin. Med.*, 1905, lxxxiii., 1). He reports five cases of diabetes insipidus in which he makes the interesting observation that in these patients the concentration of the urine remains

practically uniform, and in order to regulate for changes in the output of solids the amount of fluid or the dilution is varied. The quantity of urine depends directly upon the amount of nitrogenous food and sodium chloride taken in. These features are strikingly illustrated in the first of Meyers' patients.

This patient, a typical case of diabetes insipidus, was passing on admission, from 12,000 to 13,000 c.c. of urine and drinking about 12 litres of water a day. Under a rigid diet devised by Tallqvist, from which nitrogenous food is almost entirely excluded, the amount of urine fell at once to 7600 c.c. and on the second day to 5900 c.c. Small amounts of milk and meat added brought the amount at once up to 8100 c.c., and upon such a restricted diet it varied from 7 to 10 litres but never went as high as on admission. After having determined by a number of other experiments this remarkable relation between the amount of urine and the character of the food the patient was again placed upon a rigid diet and on the first of September, 20 grams of sodium chloride were administered. The amount of urine increased at once to 11,250 c.c. and fell again the following day to 6600 c.c. The influence of the administration of 150 grams of meat is apparent in a second rise on September 10th. The special feature of the case, however, is that the concentration of the urine as determined by the freezing point is practically uniform. This concentration is very low—the urine is markedly hypotonic and dissolves the patient's red blood corpuscles—but for the twenty-four hours the molecules and ions excreted equal the normal amount.

The second patient reacted in a similar manner to nitrogenous food and sodium chloride. Experiments on the phosphate metabolism showed that the increase in the amount of phosphate excreted did not increase the amount of urine. Twenty grams of sodium phosphate were administered, and although there was a marked increase in the amount of phosphate excreted the amount of urine and the molecular concentration remained practically constant, there being a sodium chloride retention to accommodate the increasing output of phosphates.

The third patient had diabetes insipidus complicating severe cerebral lues. Following the freezing point carefully, one finds that there was not complete loss of the ability to react with increased concentration, as values varying from 0.23 to 0.31 are found. This is brought out particularly well by collecting separately the urine from different parts of the twenty-four hours, when there is shown a fairly wide daily variation in concentration.

Case V is one of a mild grade of polyuria coming on during observation as a complication of another disease. Its advent was associated with a marked fall in pulse rate and blood pressure. It disappeared during an attack of facial erysipelas to reappear during convalescence. The power of the kidneys to yield a concentrated urine was less affected than in any of the other cases. After the administration of salt the increased amount of urine was the principal reaction, but the freezing point was appreciably reduced and the percentage of sodium chloride increased.

In these cases sodium chloride and nitrogen or urea act as diuretics. To determine the action of drugs which ordinarily cause a diuresis by acting upon the parenchyma, theocin was administered. In Cases I, II, and III there was no increase in the quantity of urine but a distinct

lowering of the freezing point and a very marked increase in the sodium chloride excretion balanced partly by increased concentration, partly by nitrogen and phosphate retention. The day following there was a marked chloride retention and the amount of urine is proportionately decreased. In Case V, however, theocin is followed by an increase in the amount of urine, and while a larger quantity of sodium chloride is excreted, the total amount and the sodium chloride concentration remain practically unchanged. Theocin must cause changes in the kidneys having the same effect as the altered circulatory conditions under the influence of fever (Case V), namely, the excretion of a more concentrated urine.

The normal individual, as Meyers shows, by striking curves, reacts to an increased salt and nitrogen elimination with increased concentration and only secondarily with increased quantity. In diabetes insipidus patients the mechanism for producing a concentrated urine is damaged. This is the primary condition and the large quantity of urine passed is only a necessary consequence by which the solids are excreted.

As has been shown the degree to which this mechanism is damaged is very variable in different patients. Determining the reaction of the urine to diet and salt gives a ready means of distinguishing between cases of true diabetes insipidus and polyurias depending upon polydipsia. Meyers gives the records of a number of such cases, depending probably upon hysterical conditions, and shows that their urine reacts as in a normal individual with change of concentration as well as with change of amount. In cases of chronic interstitial nephritis with polyuria the same conditions hold good. The tables show a marked variation in amount and concentration without definite relation to the diet. It is true that the two conditions, namely, chronic nephritis and diabetes insipidus, do approach one another, and that the ability to secrete a concentrated urine is affected in both, but only in a slight degree in nephritis as compared with diabetes insipidus.

It seems definite clinically that these cases depend upon some nervous influence, and in all probability bear a close relation to a centre in the floor of the fourth ventricle, discovered by Claude Bernard and Ekhardt. In the second portion of his lengthy paper Meyers discusses views relating to the excretion of the various urinary constituents. The matter does not lend itself to brief abstraction.

SURGERY.

UNDER THE CHARGE OF

J. WILLIAM WHITE, M.D.,

JOHN RHEA BARTON PROFESSOR OF SURGERY IN THE UNIVERSITY OF PENNSYLVANIA;
SURGEON TO THE UNIVERSITY HOSPITAL,

AND

T. TURNER THOMAS, M.D.,

ASSISTANT SURGEON TO THE UNIVERSITY AND PHILADELPHIA HOSPITALS, AND ASSISTANT
INSTRUCTOR IN SURGERY IN THE UNIVERSITY OF PENNSYLVANIA.

An Inguinal Testicle and a Tumor of an Abdominal Testicle in a Woman.—MARION (*Annales des Maladies des Organes Genito-urinaires*, December 1, 1905) records a most interesting case. The woman,

aged thirty-six years, was married at twenty, but had never been regular. She appeared to be a well and normally developed woman, with long hair, large breasts and a feminine body. On examination with a speculum the vulva showed nothing abnormal: the pubis was covered with hair, the labia majora and minora were well developed, the clitoris was of normal dimensions, and the entrance of the vagina presented myrtiform caruncles or the remains of the hymen. On examination of the vagina with the finger, however, it showed only a depth of 5 to 6 cm. When the speculum was introduced the vagina, which was of normal calibre, was seen to end in a cul-de-sac, at the depth of which no trace of a uterine cervix could be seen. The examination of the tumor showed the pelvis to be filled with a round mass about the size of a fetal head, firm, easily palpated with the vaginal finger when the other hand was applied to the abdomen. The tumor was so fixed that no movement could be given to it. It was thought to be a fibroid developed on a uterus which was masked by an imperforate vagina. The patient presented also in the first inguinal region, above the labium majus, a small tumor about the size of a pigeon's egg. It was firm, non-fluctuating, and seemed to be a fibroid of the round ligament.

A median laparotomy disclosed a tumor which was easily lifted from the pelvis and attached by a lateral pedicle, which was ligated and the tumor removed. It was then discovered that there was no trace of a uterus or ovary. The abdomen was closed and the small mass in the right groin removed. This was easily isolated, and was attached by a moderately thick cord, analogous to the spermatic cord. In about a month the patient left the hospital, completely cured.

The inguinal tumor showed the existence of a tunica vaginalis and an epididymis. The chief of the laboratory on the following day asked why a normal testicle had been sent to him for examination. It was small in size. In view of the character of the inguinal mass the abdominal tumor was considered to be developed from an ectopic testicle in the abdomen. The microscopic examinations showed the inguinal mass to be a testicle, and the abdominal tumor to be an alveolar carcinoma, a uniformly epithelial tumor, possibly the endothelioma of the Germans.

Arthrectomy as the Method of Choice in the Treatment of White Swelling of the Knee.—LEBRUN (*Journal de Chirurgie*, November, 1905), referring only to tuberculosis of the knee in children, says arthrectomy ought to be the method of choice and should be done as early as possible:

1. When white swelling is present in cases of fungous non-suppurative arthritis or osteoarthritis.

2. In unopened suppurating white swelling, antiseptic intra-articular injections of iodoform in ether (10 per cent.) should be employed first; but if a satisfactory result is not prompt, one should resort to an arthrectomy as soon as possible.

3. In white swelling with fistulae, arthrectomy will still be the method of choice, provided there are not extended and grave osseous lesions.

Lebrun insists on two points in his technique, to which he attributes great importance in the success of the operation.

1. In all cases he provides bilateral drainage, through two small openings, which are supplementary to the large incision used to open the joint. The large incision is carefully and completely sutured with

horse-hair. The drains are removed forty-eight hours after the operation, the object of the bilateral drainage being to prevent the accumulation of blood in the joint.

2. Before closing the joint it is dusted widely with iodoform powder. He then makes application with the thermocautery, brought to a dull red heat, to the whole surface of the joint, going into all the folds. In this way hæmostasis as complete as possible and complete drying of the effected surfaces are obtained. Moreover, the heat decomposes the iodoform and the iodine set free is very active, since it is in a nascent state. In this condition it attacks whatever remains of the tubercular tissue, and favors the production of fibrous tissue, which produces the cure.

The bloodless methods of treatment gave very few good results and then only in cases of tubercular hydrarthrosis. Arthrectomy, on the contrary, has been successful whenever tried and often rapidly. No recurrences after this method occurred.

Hæmaturia of Nephritis.—ALBARRAN (*Annales des Maladies des Organes Génito-Urinaires*, November 15, 1905), writing in the *Presse Médicale*, says that, until very recently, hæmaturia of renal origin was taken to indicate one of three conditions: cancer, calculus, or tuberculosis. We now recognize the so-called essential hæmaturias. The interest in the subject has been increased since Broca did an exploratory operation for hæmaturia, diagnosed as unilateral, and found a kidney apparently otherwise sound. The patient was cured by this simple operation. Albarran has previously shown that almost always one could find an evident cause of the hemorrhage, sometimes a movable kidney, at other times renal retention, and what had not been recognized at that time, lesions of nephritis. Since then others have joined him, but recently the discussion has been reopened.

Albarran says that in contusions, cancer, tuberculosis, and calculus of the kidney lesions of nephritis appear, sometimes slight, at other times marked, which play an important part in the pathology of certain hæmaturias accompanying these diseases. It has long been known that they occur in acute nephritis, more or less masked by the symptoms of this condition. Acute nephritis sometimes supervenes in a case of chronic nephritis, as after a chill, the use of certain drugs, excess of alcohol etc., when the hæmaturia may be so severe as to demand immediate operation.

The chronic nephritis capable of producing hæmaturia may be classified into the chronic diffuse and the chronic partial nephritis. In the first the evidence depends upon clinical cases, autopsy cases, and those operated on, the list of clinical cases being interminable. Wagner, Weigert, Israel, Namyn and others have established at autopsy evident lesions of nephritis which have caused during life hæmaturias more or less abundant. Surgical intervention, however, has given the best evidence, the operation often having been so urgent as to lead to fear for the patient's life, from loss of blood. The operated cases may be divided into those in which the lesion was double, and those in which the lesion appeared to be or was in reality unilateral.

Studied from the clinical point of view, the hæmaturia presents three different conditions. In the first group are the cases of Bright's disease in which some day hæmaturia appears and lasts a variable period, nearly always a long time. The diagnosis in these cases is

always easy. In the second group the hæmaturia precedes the appearance of the chronic nephritis by perhaps some years. There is a sudden large hemorrhage, and then the years pass with only one or two hemorrhages before the nephritis appears. Finally, in a third group the hæmaturia is the only symptom, without anything else to suggest Bright's disease. It is spontaneous without cause, it is not modified by repose or movement, the blood is habitually blackish and does not clot. The patient continues his ordinary way of living, although there is blood in the urine constantly for days, months, or years.

The cases of partial nephritis capable of producing hæmaturia may show small insignificant lesions, and yet the bleeding may be as violent as in those cases of diffuse nephritis. The demonstration of these lesions is due to the study of those kidneys operated on. During the operation the lesions may be detected, such as the adhesions of a perinephritis, depressions on the surface, blanched areas indicating sclerosis, or small cysts. But in some cases both macroscopic and microscopic examinations may fail to show lesions when they actually exist, as Albarran and Motz found in one case, operated on by Nicholich, of Trieste. The examination of the urine ought never to be neglected in these cases. Sometimes nothing abnormal will be found even in grave cases of double nephritis, as Israel has shown, but in others one observes, in the intervals between the crises, traces of albumin and casts.

From the standpoint of treatment much has been done by simple exploration, nephrotomy, and decapsulation in causing these abundant hemorrhages to cease. Sometimes this cessation is definite, at other times the arrest is more gradual.

Destroying the Urogenital Diaphragm or Pelvic Floor as a Means of Relieving Prostatic Ischuria; a New Operation.—ANDREWS (*Annals of Surgery*, December, 1905) objects to prostatectomy as a routine operation, because of its many deaths. Any operation of this kind is dangerous, a long series of cystotomies for instance, showing a regular percentage of deaths. Unless there is a crowding together of the walls of the prostate, as by the bones and ligaments of the pelvis, enlargement alone will not cause stoppage of the urine. It is because of such compression that the lumen of the urethra is encroached upon. Andrews would relieve this compression by freeing the prostate from its attachments and confinement under the pubic arch. He makes a curved incision through the skin and fat corresponding in direction to the pubic arch, after pushing up the testicles and holding them out of the way by a truss or binder. After pushing the vessels aside and dividing the suspensory ligament of the penis the cutting off of the deep fascia and part of the levator ani allows the membranous urethra and prostate to be brought into view by pulling on the penis. The puboprostatic ligaments are now in full view and are made tense by the traction. These are then divided when the prostate comes further into view. The pelvic diaphragm supporting the prostate is then cut along both lateral borders when the whole mass, including the prostate and neck of the bladder, falls freely backward and downward, almost as if they were herniating into a new position. Special precautions are taken against dividing the dorsal arteries, veins and nerves of the penis. The wound is then closed with only capillary drains in the angles. As a

result of this operation the prostate falls backward into a wider space between the bones, and the general result is a great loosening up of all the structures concerned in pressure on the neck of the bladder. Great relief of rectal reflexes and spasm result. The retroprostatic pouch is abolished and the bas fond becomes a true funnel, with its outlet at the lowest point.

The Law of Accelerating Risk in Cancer.—ANDREWS (*Annals of Surgery*, December, 1905) says that there is a mathematical law of growth and states it as follows: The risk of recurrence (or rate) in malignant growths increases as the square of the time of growth, or conversely the risk of recurrence, diminishes in the ratio of the square root of the time after incidence. Thus doubling the time increases the risk of recurrence or metastasis not twice but 2^2 , or fourfold; tripling the time increases the risk 3^2 , or ninefold; quadrupling the time increases it sixteenfold, etc. There is an early golden period in which the life of the cancer patient may be saved.

The life history of any malignant growth may be divided into three periods: (1) The microscopic period. (2) The macroscopic period before metastases. (3) The period after metastasis, or the carcinosis period. Of the first we know nothing except by inference. Of the second we have abundant clinical evidence, and it is to this stage that radical surgery should be mainly limited. The writer described a "risk curve" plotted on a clinical chart, by which he determines certain limits, beyond which it is useless to attempt a radical operation. He has tested this method and has every faith in its accuracy.

The Use of X-rays in Carcinoma.—PUSEY (*Annals of Surgery*, December, 1905) says that all forms of epithelioma may be destroyed by the x-ray, with about equal readiness. There is a great variability in the resistance of different lesions. This is not so much a variation in the resistance of the various types of epitheliomas as it is a variation in susceptibility of the tissues of various individuals, for in the cases that are resistant the surrounding tissues seem to have as great relative tolerance as the diseased tissues. Carcinoma on the surface can, with practically unvarying regularity, be destroyed with x-rays and be replaced with healthy scar tissue. Concerning deeply seated carcinomas our facts are not so authentic. The writer reports one case of cancer of the breast, without involvement of the skin, with enlarged axillary glands and with spinal metastasis when x-ray treatment was begun. Postmortem examination showed that the breast was a mass of connective tissue without any carcinoma tissue remaining. The same was true of the axillary contents. In a similar case postmortem disclosed a similar condition in the breast, but the axillary glands were not affected by the x-ray treatment. This was probably the result of insufficient exposure of the axilla to the x-rays. The writer believes that any epithelioma that has not given metastasis and has not deeply involved the subcutaneous tissues may be converted into as healthy scar tissue as can be gotten after the excision of an epithelioma. As for permanency of results the cases will bear a fair comparison with those treated by any other method. If the removal of the contiguous glands is indicated the case should be treated surgically and not with the x-rays. One patient with carcinoma of the supraclavicular glands

and those in the axilla, and well on the down grade, regained her usual vigor after six months' treatment with the x -rays, and three years after beginning treatment she is in her normal, fairly vigorous health, symptomatically cured. In all operable carcinomas, except epithelioma, however, operation is preferable to the use of the x -rays.

Pusey thinks that the x -rays do not stimulate the growth of the cancer, nor increase the danger of metastasis. The histological findings show that the first thing noted is a degeneration and disintegration of the youngest peripheral cells. He has never seen metastasis develop while an epithelioma was under x -ray treatment, unless there was every reason to believe that metastasis was present when the treatment began. On the contrary he has seen metastasis escape, when there was much reason to fear its occurrence.

A Typical Disease of the Tendo Achillis.—SCHANZ (*Zentralblatt f. Chirurgie*, December 2, 1905) calls attention to an affection of the tendo Achillis of which he finds no mention in the literature. It follows excessive use of the tendon, and the patient complains of pain above the heel, chiefly in the use of that tendon, as in walking, riding a wheel, or skating. He exhibits limitation of the movements of the foot, lameness, and an outward turn of the toes in walking. The symptoms are more evident when the shoes are removed, and will be obscured by the wearing of high-heeled shoes. The patient locates the pain in the tendon itself and not at its insertion, as in disease of the bursa at the point, achillodynia or Albert's disease. The swelling is spindle shaped, begins above the lower end of the tendon, and disappears where the tendon joins the muscle. Schanz believes that the inflammation involves the tendon itself and not the tissue immediately surrounding the tendon, and that it is more frequent than disease of the bursa.

The treatment consists chiefly in preventing flexion of the foot and, therefore, stretching of the tendon. A broad strip of adhesive plaster is passed backward on the plantar surface of the foot from the toes and made to extend upward over the heel to the calf of the leg. Circular strips and a bandage then hold this in place. With a well-laced shoe and too low a heel the patient can usually go about without pain. In two or three weeks the pain and swelling will disappear.

Observations on the Use of the Jaboulay Anastomosis Button without Suture.—KLAUBER (*Zentralblatt f. Chirurgie*, December 9, 1905) says that one of the advantages of this button over that of Murphy is that it gives a more exact contact of the apposed serous surfaces. Since the difference in the diameters between the inner and outer cylinder in the latter is greater than in the Jaboulay button the opening necessary for the introduction of each half is relatively larger and the wrinkling produced by the purse-string suture greater. This interferes with the close approximation of the two halves. The larger diameter of the inner cylinder in the Jaboulay button is also of advantage in permitting the more easy passage of intestinal contents during the period in which it is in place. The diminution of metal mass makes the button lighter and, therefore, decreases the tendency of the recumbent position to retard its escape. On account of the narrowness of the retaining ring of intestinal wall drawn in by the purse-string suture,

there is some difficulty in holding the half button in position, but a little care will overcome this. That the adhesion of the serous surfaces is stronger and safer with the older button cannot be justly claimed, since with both buttons the compression area is only about 3 cm. from the outer edge. The inner half of the pressure ring quickly necroses, so that its width has little importance. The writer calls attention to the fact, however, that there sometimes persists a crevice through which intestinal contents can escape after the button halves have been brought together. In one case which he saw operated on this difficulty caused the operator to remove the button and to substitute another method of anastomosis. In one of his own cases, the same difficulty arising, he closed the crevice by a reinforcing circular suture, with a successful result. He says that this trouble comes from the too fine construction of the screw mechanism, by which the button is locked, so that an oblique articulation may result.

THERAPEUTICS.

UNDER THE CHARGE OF

REYNOLD WEBB WILCOX, M.D., LL.D.,

PROFESSOR OF MEDICINE AND THERAPEUTICS AT THE NEW YORK POST-GRADUATE MEDICAL SCHOOL AND HOSPITAL; VISITING PHYSICIAN TO ST. MARK'S HOSPITAL.

ASSISTED BY

HENRY HUBBARD PELTON, A.M., M.D.,

INSTRUCTOR IN MEDICINE IN THE NEW YORK POST-GRADUATE MEDICAL SCHOOL AND HOSPITAL;
CHIEF OF THE MEDICAL CLINIC, PRESBYTERIAN HOSPITAL DISPENSARY, NEW YORK.

Thyroid Extract in Eclampsia.—R. W. LOBENSTINE draws the following conclusions from the literature of the subject and the results obtained in the treatment of six cases of eclampsia and threatened eclampsia by means of thyroid extract:

1. The extract undoubtedly lowers pulse tension and favors diaphoresis and diuresis, but in order to obtain good results large doses must be given and thyroidism rapidly induced. An early re-establishment and increase of the urinary secretion occurs.
2. Lange and Nicholson seem to think that the extract may have some specific action in eclampsia and the pre-eclamptic state, and that possibly by favoring metabolism it is able to counteract the effect of the toxins.
3. The author does not agree with Nicholson when he states that the re-establishment of the renal secretion is the one essential and all-important indication in treatment of eclampsia, yet since the kidneys are so deeply involved, and inasmuch as they can be influenced by treatment so much more readily than the liver, he believes in devoting as much attention as possible to the improvement of their condition.
4. The author advises against the use of the extract in the asthenic type of the disease.
5. The heart and pulse must be carefully watched.
6. The extract must be first in order to be of any value.
7. Since the heart muscle in

eclampsia is particularly susceptible, and since in some instances the thyroid extract might prove too depressing, the author advises moderate preliminary exhibition of heart tonics, such as caffeine or strophanthus, and finally states that he does not consider the administration of thyroid extract superior to other methods of treatment, but believes that it may prove of value in some subjects.—*Bulletin of the Lying-in-Hospital of the City of New York*, 1905, No. 3, p. 68.

A Specific Serum in Exophthalmic Goitre.—JOHN ROGERS has employed a serum made from the thyroid glands of exophthalmic goitre patients. The serum was prepared by grinding the glands to a pulp, extracting them with normal salt solution and straining off the coarse fibres. The resulting filtrate was then frankly acidified with acetic acid, a heavy precipitate of nucleoproteids resulting. The supernatant fluid was then siphoned off and half saturated with ammonium sulphate, which carried down the remaining nucleoproteids and the globulin, including the thyroglobulin or supposed active secretion of the gland. These precipitates were combined, and after removing the neutral salt on dialysis were to some extent injected while fresh into rabbits. The major part of the precipitate was dried for preservation. After five weeks of treatment the rabbits were bled to death and a serum which the author designates as serum A was extracted. Serum B was made later from the dried precipitate, which was dissolved in normal salt solution and injected into rabbits. Serum C was prepared in a similar manner, but later. Serum D, made from the normal thyroid, has not proved satisfactory. Ten subjects affected with exophthalmic goitre have been treated with serums A, B, and C, with a result of three apparently perfect cures, three rescued from a critical condition and are now approaching cure; the others are more or less improved. The doses of the serums were 5 minims gradually increased to 10 or 15 minims. Swelling and erythema may appear at the site of the injection. The remedy is one which must be used with great care, but seems to be capable of bringing about remarkable results.—*The Journal of the American Medical Association*, 1906, No. 7, p. 487.

Dechloridation Treatment.—C. MONGOUR considers that by prescribing a diet lacking in chlorides we are able to give great relief to patients suffering from dropsy, either cardiac, renal, or hepatic. The theory that the retention of chlorides causes dropsical conditions he explains as follows: The non-eliminated chlorides accumulate in the tissues and attract the water necessary to their dilution, consequently œdema appears as a result of this chloride retention. It must not be forgotten that before there is visible œdema in cardiac and renal disease there occur infiltrations of the viscera, constituting the pre-dropsical stage of Vidal; that these infiltrations are present is proved by the abnormal increase in weight that these patients exhibit. The method of getting rid of this chloride retention and to prevent further accumulation is, naturally enough, to prescribe a diet lacking in chlorides. The ideal regimen is a strict milk diet. Milk contains about 22 grains of sodium chloride to the quart, and considering 3 quarts daily as necessary, the patient on this basis would receive about 70 grains of salt per day. Many patients, however, will not endure such a restricted diet; consequently the author advises one containing about 14 ounces of dark

meat and 16 ounces of bread made without salt, or instead of this about two pounds of potatoes, or a mixed diet of milk, green vegetables, and starches without salt. Coffee and tea or infusion of linden leaves and, if necessary, a little white or red wine. The author considers the dechloridation treatment one of the most important of the recent advances in the therapeutics of cardiac, renal, hepatic, and other dropsical disorders.—*Journal de Médecine de Bordeaux*, 1905, No. 48, p. 841.

Beer Yeast in Gynecology.—M. AUDEBERT has employed beer yeast in the leucorrhœa of pregnant women and has obtained excellent results. Of twenty-nine cases treated, twenty-six were cured and three were improved. Among them were instances of simple leucorrhœa, leucorrhœa with vulvitis, granular vaginitis, gonorrhœal vaginitis, vulvar vegetation and cervicitis. In only two cases was more than a month necessary to effect a cure. The author has also used yeast to disinfect the genital canal prefatory to operations. He has employed the dry yeast in obstetrics to the exclusion of all other antiseptics in the following conditions: marked vaginitis, premature rupture of the membranes, before various intrauterine operations, such as the introduction of bougies, bags, and forceps, and in postpartum hemorrhage. In no case did any complication follow delivery. He concludes if bacteriological evidence in favor of beer yeast confirms the clinical results this substance should furnish an excellent non-dangerous and non-toxic means of disinfecting the genital tract before accouchement and before gynecological operations.—*Revue Française de Médecine et de Chirurgie*, 1905, No. 51, p. 1248.

Eucaine Lactate in Nose and Throat Operations.—T. J. HARRIS in a paper upon this subject states that eucaine lactate possesses the advantages over cocaine that it causes no hyperemia, ischemia, or shrinkage of tissues. If contraction is desired the eucaine may be combined with adrenalin. The author has used eucaine in about fifty instances in such conditions as septal deformities, tuberculous infiltration of the larynx, laryngeal papilloma, adenoids, hypertrophied turbinates, etc. In no case was there the slightest pain, discomfort, or toxic effect. The author considers that eucaine lactate is an excellent substitute for cocaine and may be employed in strong solutions without fear of toxic symptoms. It does not seem to lose its anæsthetic properties during the usual periods of office use. Its anæsthetic effect is hardly as great as that of cocaine; consequently in very painful operations it should be used in stronger solution, a 15 per cent. to 20 per cent. eucaine lactate solution being about equivalent to 10 per cent. solution of cocaine.—*American Medicine*, December 30, 1905, p. 1102.

Adrenalin in Therapeutics.—M. JOSUE states, as the result of experimentation, that he finds the lower animals less susceptible to the action of this substance than man, for while daily doses of $\frac{1}{16}$ grain, many times repeated, will cause untoward symptoms in man, a rabbit can take four times this quantity without inconvenience. Consequently in the author's opinion one should not inject hypodermically, in the human being, more than $\frac{1}{16}$ of a grain, and the latter dosage should be employed only under exceptional circumstances. The drug is less toxic when given by mouth, but it should nevertheless not be given

thus in larger dose than that indicated. In whatever way it is administered its use should not be continued for more than six days at a time, because of the cardiac or arterial difficulties which may ensue.—*La Semaine médicale*, 1906, No. 1, p. 8.

Scarification and Cauterization by Means of Zinc Chloride in Lupus.—J. LE CALVE recommends the following treatment: If there are adherent crusts these are softened by means of wet dressings, twenty-four hours before beginning the treatment; the diseased surface is then cleansed by means of soap, water, alcohol, and bichloride solution, and scarified in the usual manner; the hemorrhage is controlled by means of cotton moistened with 1:1000 mercuric bichloride solution and the scarified area swabbed over by an applicator holding a bit of cotton moistened with 10 per cent. zinc chloride solution. For the rest of the day the diseased surface is covered with a compress, but upon the next day it is exposed to the sun. The treatment is repeated at intervals of one week, and from it the author reports good results. It is particularly to be recommended when for any reason light treatment is impossible.—*Gazette médicale de Nantes*, 1905, No. 52, p. 1057.

PEDIATRICS.

UNDER THE CHARGE OF

LOUIS STARR, M.D.,
OF PHILADELPHIA,

AND

THOMPSON S. WESTCOTT, M.D.,
OF PHILADELPHIA.

Treatment of Tuberculous Peritonitis during Childhood.—G. FALUDI (*Jahrbuch f. Kinderheilkunde*, 1905, Bd. lxii. S. 304) has collected three hundred and six cases of tuberculous peritonitis in children less than fifteen years old; almost half occurred between the ages of three and seven; the sexes were about equally represented; of autopsies on tuberculous subjects 16 per cent. were found to have peritoneal involvement. In doubtful cases he advises the injection of from 2 to 5 milligrams of tuberculin; he has never seen any ill results from it. Of seventy personal cases, observed between 1897 and 1902, forty-six came to laparotomy. He describes the method employed by him very carefully, laying stress upon the postoperative treatment with drugs (creosote, etc.), rest, good food, and good air. Sea air is the best invigorator known to him. Of his cases, twenty-seven (58 per cent.) belonged to the serous type of the disease; fifteen were cured, eight died. In this type of the disease he does not consider immediate operation absolutely necessary, excepting when the patient is not in a position to have other suitable treatment. If after medicinal-hygienic treatment no improvement occurs, or if the accumulation of fluid disturbs the respiration, operation is indicated.

He advises against tapping, as it has only a palliative value. In ulcerocaseous and fibroadhesive cases laparotomy is advised, and the earlier it is performed the better the chances of recovery; if the process is too widely spread operation will not cure. In intestinal obstruction operation is advisable, but often fails. If small fistulae complicate the condition, operation is indicated and will usually cure; if the fistula is large conservative treatment will cure it ultimately. Grave tuberculosis elsewhere contraindicates operation; slight pulmonary, pleural, cutaneous or bony tuberculosis does not. Circumscribed peritonitis is rare in childhood and should always be operated on. Antituberculous after-treatment is very important.

Ovarian Tumors in Children.—A. M. WINTERITZ and G. FINALY (*Jahrbuch f. Kinderheilkunde*, 1905, Bd. lxii. S. 402) report four cases of ovarian tumors in children: three of them were embryomata, one a simple unilocular cyst. All four patients recovered after operation. In three of the cases colicky attacks due to torsion of the pedicle were the first symptoms of the existence of the tumor. Constipation and vesical irritation existed in three of the cases; adhesions were not observed and ascites existed in only one case. None of the patients showed signs of early puberty. The diagnosis from appendicitis is difficult at times; in one of their four patients a diagnosis of appendicitis was made, the operation revealing the ovarian tumor; in this case the torsion had induced suppuration, the pus breaking through the anterior abdominal wall.

Treatment of Leukæmia with Roentgen Rays.—H. FLESH (*Jahrbuch f. Kinderheilkunde*, 1905, Bd. lxii. S. 293) reports the case of a boy thirteen years old. For two months he had been gradually developing the picture of typical leukæmia, his spleen reaching upward to the seventh interspace, two inches beyond the median line at the umbilicus, and down to the crest of the ilium. He had 2,870,000 red corpuscles, 230,000 leukocytes, and 40 per cent. hæmoglobin. After two weeks of ineffectual medical treatment Roentgen rays were employed. After forty-five sittings, during which the spleen, thigh, and sternum were treated for a total of eight hundred and forty-six minutes, the red corpuscles had increased to 5,100,000, the hæmoglobin to 90 per cent., and the leukocytes diminished to 14,000; the spleen had diminished in size to one-third of its original dimensions and the patient felt himself in perfect health. Some weeks later the symptoms returned rapidly, although the treatment had been continued constantly, and one day the patient collapsed suddenly, dying before a blood examination could be made. The postmortem blood examination showed a very large number of leukocytes as compared with red corpuscles, the proportion being 1 to 2 or even 1 to 1; 90 per cent. of these were lymphocytes. The patient evidently had suffered a transition from a myeloid to an acute lymphatic leukæmia.

Moser's Polyvalent Scarlet Fever Serum.—J. VON BOKAY (*Jahrbuch f. Kinderheilkunde*, 1905, Bd. lxii. S. 428) has employed this serum up to the time of reporting in twenty-one cases; seventeen recovered, four died. He finds that the serum injection improves the general condition favorably within twenty-four hours; this is noted whether the temperature falls quickly or slowly. The cerebral symptoms diminish

almost at once. The eruption pales quickly and visibly; in early cases the injection aborts it. The temperature declines quickly, averaging 2.1° C. during the first twenty-four hours in his seventeen cases; collapse symptoms were never observed. The pulse and cyanosis improve proportionately. The pharyngeal necrosis is always favorably affected; in only one case did it spread deeper. Of complications he noted glandular suppuration six times, otitis media three times; the kidney complications seemed favorably affected by the serum. Serum exanthemata were observed twelve times, but they were never of a grave type. He repeats his opinion, expressed two years ago, that Moser's polyvalent scarlet fever serum acts as an antitoxin in the scarlatinal infection.

Operative Treatment of Vesical Stones in Children.—The dangers and disadvantages of perineal section are so great that A. M. WINTERNITZ (*Jahrbuch f. Kinderheilkunde*, 1905, Bd. lxii. S. 387) has entirely discarded it in the operative treatment of bladder stones in children. He performs litholapaxy and suprapubic cystotomy together. The latter is the operation of choice in children under three, as the calibre of the urethra is too small for the passage of the lithotripter; also in the presence of cystitis so grave as not to be improved by irrigation. In performing the suprapubic operation he does not consider it necessary to distend the bladder, as it rises a considerable distance above the pelvis and peritoneal injury is therefore almost impossible. The scar resulting from the operative wound never interferes with the urinary or sexual act, as is often the case where the perineum has been opened, and the interior of the bladder is much more easily explored. Drainage is not employed in the presence of normal urine and a healthy bladder wall; the wound is completely sutured and the patient is well after probably ten days; the prevesical space is drained for a few days and the abdominal wall sutured. A permanent catheter is never employed, because of the great danger of becoming clogged and the delicacy of the mucous membrane in children. When cystitis coexists the bladder is drained through the suprapubic wound by means of a suction drain, the wound being irrigated from time to time through it. The average duration of invalidism for these patients is 22.6 days. When litholapaxy could be employed (eighteen cases) the patients were perfectly well after an average of nine days. The indications for this operation, when no cystitis or pyelitis exists, are in the cases in which the urethra is sufficiently large to permit the use of the instruments and in which the stone is freely movable and not too hard.

Eclampsia in the Newborn.—T. MORI (*Monatsschrift f. Kinderheilkunde*, 1905, Bd. iv. S. 73) reports the case of the newborn child of a thirty-year-old primipara, who before the birth of the child had been complaining of headache, and had shown moderate albuminuria and oedema of both legs; on the third day the infant was suddenly taken with an eclamptic convulsion and died. The autopsy showed diffuse changes of the vascular system, particularly along the cerebrospinal axis, and parenchymatous degeneration of liver, kidneys, and adrenals. The author sees in this case a confirmation of the theory of Pestalozzi, who claims an ovular origin for the production of the poisons causing eclampsia. He expresses himself as doubtful whether albuminuric mothers should be permitted to nurse their infants, in the interest not only of the mothers but also of the children.

OBSTETRICS.

UNDER THE CHARGE OF

EDWARD P. DAVIS, A.M., M.D.,

PROFESSOR OF OBSTETRICS IN THE JEFFERSON MEDICAL COLLEGE, PHILADELPHIA, ETC.

Spontaneous Labor in a Patient Previously Delivered by Pubiotomy.—REIFFERSCHIED (*Zentralblatt f. Gynäkologie*, 1906, No. 18) reports the first case of spontaneous labor in a patient previously delivered by pubiotomy. The pelvis was contracted, the true conjugate being 7 cm. The first labor occurred in 1903 and was terminated by forceps, the child perishing. The mother had fever during her convalescence. The second labor occurred March 20, 1905, and was terminated by subcutaneous pubiotomy upon the left side followed by version and extraction. Mother and child made good recoveries. On March 30, 1906, the patient was again in labor, the cervix dilated and the head easily movable about the pelvic brim. As descent and engagement did not occur the operator introduced Gigli's saw, expecting to be obliged again to perform pubiotomy. The membranes were then ruptured and the child delivered by version and extraction without opening the pubes. The biparietal diameter of the child's head measured 9.5 cm., and mother and child made a good recovery. A skiagraph of the mother's pelvis showed separation of the ramus of the pubes at the symphysis and also at the site of the previous operation.

Postmortem Cæsarean Section.—TUITLER (*British Medical Journal*, May 12, 1906) reports the case of a woman who died near the end of the eighth month of pregnancy from meningitis of two weeks' duration. As it was impossible to deliver the patient rapidly through the vagina, the abdomen was opened and the child extracted. It survived the mother's death and subsequently did well.

Bossi's Dilator in Premature Separation of the Placenta.—JOLLY (*Zentralblatt f. Gynäkologie*, 1906, No. 18) records twenty-five cases of premature separation of the placenta without a maternal death. Thirteen of the children were lost. In two of these cases Bossi's dilator was employed. The first of these was a multipara at eight months suffering from nephritis, with separation of the placenta and vigorous hemorrhage. Frommer's modification of Bossi's dilator was employed and in thirty-five minutes it was possible to empty the uterus. There were no lacerations. The second case was that of a primipara near the end of gestation suffering from nephritis. The Bossi-Preiss dilator was successfully employed and the uterus emptied by version. Jolly adds two other cases, the first of which was a multipara at term, who soon after the beginning of labor had a severe hemorrhage. The placenta could not be felt upon examination. Frommer's instrument was employed under anaesthesia and in twenty minutes version was performed. The cord had been wrapped about the child and the placenta

was almost entirely separated. The cervix was torn sufficiently to cause free hemorrhage which ceased when stitches were inserted. In the second of these cases there was hemorrhage for eight days at intervals, with no evidence of nephritis. The placenta could not be reached by examination and Frommer's instrument was employed. In twenty minutes it was possible to rupture the membranes and extract the child. A laceration 3 cm. long was found upon the right side of the cervix, which gave rise to free hemorrhage. This ceased when sutures were inserted.

Acute Yellow Atrophy of the Liver Occurring during Pregnancy.—ACCONCI (*Annale de Obstetricia Ginecologia*, 1906, No. 3) contributes a paper upon this subject in which he concludes that this condition must not be considered as a separate and definite disease, but as an introduction to an autointoxication peculiar to pregnancy. The severe form is characterized by rapid development of coma, while the milder form tends to amelioration and possible recovery. The pathological findings in these cases mostly resemble those of eclampsia. The parenchyma of the liver is affected in these cases and some of the symptoms observed result from disturbance in the circulation in that organ produced by parenchymatous changes.

Autointoxication: Its Relation to Certain Cardiovascular Disorders.—BATTY SHAW (*British Medical Journal*, May 12, 1906) publishes in condensed form a lecture delivered before the Royal College of Physicians upon this subject. He has studied variations in blood pressure caused by the injection of kidney extract and also of substances derived from the liver and the brain. He concludes that kidney extract more than any other produces an increase in blood pressure. Extracts of the liver and brain show a much greater tendency to cause a fall of blood pressure of brief duration. Increased pulse tension, then, must draw our especial attention to kidney failure. These observations bear upon the diagnosis of toxæmia and threatened eclampsia. In two typical cases of the nephritis of pregnancy the writer obtained repeated tracings of blood pressure illustrating its remarkable increase. In some of the most virulent cases of toxæmia and eclampsia in proportion as the condition becomes grave blood pressure is diminished.

The Operative Treatment of Puerperal Pyæmia, with the Report of a Successful Case.—CUFF (*Journal of Obstetrics of the British Empire*, May, 1906) has collected six successful cases of puerperal pyæmia and adds the following case in his own experience. The patient had been attended by a midwife and gave birth to a large child and placenta without laceration of the perineum. Two days afterward a chill followed by profuse perspiration occurred, the temperature rising to 104.8°. The temperature not falling, the uterus was curetted and a few small shreds of placenta removed. The patient continued to have marked fever with sweating. Antistreptococcic serum was injected without benefit. A doughy lump about the size of the fist developed in the right iliac region in the upper part of the broad ligament. A mass the thickness of three fingers stretched from the uterine wall internally to the pelvic wall externally. On abdominal section the ovaries and tubes were found normal. Having packed off

the intestines with gauze the mass in the broad ligament was incised, revealing a thick bundle of thrombosed veins. These were ligated and the ovarian vein was found thrombosed and also tied. The peritoneal incisions were closed by catgut and the abdomen closed. The patient made a gradual recovery with fluctuations of temperature and pain in the left knee- and hip-joint. It is thought that the operation secured the patient's recovery by controlling the absorption of septic material from the thrombi.

Pyelitis in Pregnancy and the Puerperium.—CRAIGIN (*Surgery, Gynecology, and Obstetrics*, May, 1906) adds to his previous contribution upon this subject. His experience now embraces seventeen cases occurring during pregnancy and six during the puerperal period. Regarding etiology he believes that the pressure of the uterus upon the right ureter and kidney causes diminished vitality in the tissues which invites inflammation. The exciting cause is usually infection by the colon bacillus, often preceded by infection in the intestinal tract. The kidney substance is not primarily involved but may become so in severe and protracted cases. During the puerperal period the parenchyma of the kidney may become affected. The bladder is usually involved secondarily. In diagnosis pain and tenderness over the kidney and ureter, fever often accompanied by chill, irritability of the bladder, and acid urine with pus and usually the colon bacillus were present. In treatment the patient should lie as much as possible upon the side opposite to the affected kidney. Urotropin and large draughts of water should be administered. If the pyelitis fails to improve and the fœtus has reached viability labor may be induced.

One-child Sterility.—MATTHEWS (*Surgery, Gynecology, and Obstetrics*, May, 1906) found in one thousand consecutive gynecological histories eighty-two histories of one-child sterility. There were seventy-five histories of absolute sterility. In one hundred private cases there were fifteen of one-child sterility. In seeking for the causes of this condition the mother rather than the father was almost invariably at fault. It is not the result of congenital conditions such as ante-flexion or contraction. The cause must be sought in something which occurred during the pregnancy or puerperal period. Gonorrhœa is a frequent cause acting through occlusion of the Fallopian tubes. Septic infection is next in frequency, while retroversion or retroflexion of the uterus is also a factor. Poor general physical condition with endometritis is found in some cases. Physicians should take especial pains in securing the proper hygiene for pregnant patients and in detecting and promptly treating gonorrhœa during pregnancy and the puerperal period.

Subchorial Hæmatoma of the Decidua.—HUTCHINSON (*Journal of Obstetrics of the British Empire*, May, 1906) had an opportunity to study seven cases of blood moles. From these he concludes that in these cases a pathological condition of the endometrium exists before conception. The ovum is less securely implanted than normally and hemorrhage into the decidua with thrombosis into intervillous space occurs with detachment of villi, compression of villi in greater or lesser extent, and interference with the nutrition of the fœtus. If the

embryo is young it dies and is completely or partially absorbed. If further advanced it develops imperfectly. Combined hemorrhage and thrombosis result in the development of a sac. There is no distinct evidence that the corpus luteum influences the development of the ovum.

GYNECOLOGY.

UNDER THE CHARGE OF

HENRY C. COE, M.D.,
OF NEW YORK.

Cancer of Uterus and Ectopic Gestation.—POKROWSKI (*Russki Vratsch: Zentralblatt f. Gynäkologie*, 1906, No. 16) reports the case of a patient, aged twenty-six years, who entered the hospital complaining of severe abdominal pains and profuse hemorrhage. On examination cancer of the cervix uteri was found, with a tumor the size of the fist in the right side of the pelvis. The patient stated that her last period had appeared at the normal time, six days after the cessation of which the flow reappeared, accompanied by severe abdominal pains.

The abdomen was opened and the tumor was found to be an ectopic sac, which was removed with the cancerous uterus and the opposite tube and ovary, the patient making a good recovery and being discharged on the twenty-fourth day.

Primary Cancer of the Vagina.—JAKUB (*Zentralblatt f. Gynäkologie*, 1906, No. 16) had a patient, aged forty-four years, who had been ill for five months with lancinating pains in the vagina and a bloody discharge. On the posterior wall of the vagina at the junction of the upper and middle thirds was a nodule the size of a walnut, above which there was a large ulcerating surface. Microscopic examination showed the presence of epithelium. The vagina and uterus were removed, a long oblique perineal incision being made. The operation lasted two and one-half hours, clamps being applied to the broad ligaments, and the wound plugged with gauze. The patient was discharged at the end of the third week.

Mechanical Irritation as a Cause of Cancer.—GOEBEL (*Volkmann's Samml. klin. Vorträge*, No. 403) after reviewing the literature on the etiology of cancer arrives at the conclusion that it is only in exceptional instances that a direct connection between the disease and mechanical irritation can be established. In these either embryonal tissue was present at the site of the lesion, or else the disease developed from cicatricial tissue. The writer attaches more importance to chemical irritation, but is uncertain whether this favors the proliferation of embryonic cells, according to Cohnheim's theory, or the growth of germs embedded in the normal tissue, as Ribbert holds. He rejects the parasitic theory, since all experiments have failed to cause the development of cancer through acute or chronic traumatism.

OPHTHALMOLOGY.

UNDER THE CHARGE OF

EDWARD JACKSON A.M., M.D.,
OF DENVER, COLORADO,

AND

T. B. SCHNEIDEMAN, A.M., M.D.,

PROFESSOR OF DISEASES OF THE EYE IN THE PHILADELPHIA POLYCLINIC.

Determination of the Refraction by Means of the Inverted Image. LOHNSTEIN (*Graefe's Archives*, vol. lx.) suggests the possibility of measuring the refraction by means of the displacement observed in the inverted image as the object lens is moved from side to side. The inverted image becomes displaced with the lateral movements of the lens. The amount of such displacement depends upon the refraction of the eye under examination. Lohnstein takes for the point of departure with which to compare such displacement a visible point fixed in the anterior focal plane of the lens; this point will move coincidently with the movements of the lens. In emmetropia the fundus and the fixed point are displaced by the same amount; in myopia the point moves faster than the fundus; in hypermetropia it moves slower. The amounts of relative displacement serve to determine the degree of the ametropia.

Corneal Astigmatism and Central Myopic Choroiditis.—SENN (*Archiv f. Augenheilk.*, vol. xlviii.) demonstrates that corneal astigmatism and central myopic choroiditis are more frequent in the female than in the male sex. Of two hundred and five eyes affected with central choroiditis 78 per cent. were astigmatic. On the other hand, of one hundred and ninety-six eyes with myopia above 7 D. and without choroidal lesions there were 72.4 per cent. non-astigmatic.

These two reports clearly show the relations which subsist between astigmatism and macular lesions.

Vernal Catarrh in Turkey.—TRANTAS (*Archiv d. Ophthalmol.*, December, 1905) finds that this disease is more frequent in Turkey than in any other country (about 0.75 per one hundred eye patients).

It is much more common in males than in females, in the proportion of 9 to 10. Vernal catarrh is an affection of the warm season; thus of ninety-two cases reported, seventy-three occurred from May to September.

The cases recur from year to year for a number of years, six to eight. Saemisch, who first described the malady, observed a case which recurred for twenty-three years. The disease is practically always bilateral, although the two eyes may be quite differently affected.

The affection is localized in the tarsal conjunctiva of the upper lid (palpebral form), or at the limbus (pericorneal form), or more

frequently in both of these regions at once (mixed form). Complications are very rare; the resistance of the cornea is remarkable and this is one of the points of difference between it and trachoma which it greatly resembles. The great majority of cases occur between the ages of ten and twenty-five years.

The author further emphasizes a clinical sign, consisting of a number of white points developed deeply within the pericorneal swelling. This sign has not been mentioned before, although it occurs in a decided proportion of cases; when present it is a pathognomonic sign of vernal catarrh. Microscopic examinations by the author have shown that these cases depend upon either a degeneration of the epithelial follicles, which finally disappear and give rise to cystic cavities, or upon a degeneration of the epithelial covering which becomes an amorphous mass.

Demonstration of the Accommodation in an Enucleated Eye of an Infant.
 —HEINE (*Graefe's Archives*, vol. lx. p. 448) measured the static refraction of an infant's eye immediately after enucleation by skiascopy and found it the same as during life. The accommodation provoked by the induced current remained almost normal for ten minutes, even after a button-hole opening had been made in the eyeball. The experiment in imitation of that which Beer had made on the monkey's eye, proves that contrary to the theory of Helmholtz normal ocular tension is not necessary for the accommodation and that the accommodation does not modify the intraocular tension.

DISEASES OF THE LARYNX AND CONTIGUOUS STRUCTURES.

UNDER THE CHARGE OF
 J SOLIS-COHEN, M.D.,
 OF PHILADELPHIA.

Mycosis.—The etiology and treatment of mycosis occurring in the upper respiratory tract is the subject of an essay by Dr. JOHN SENDZIAK, of Warsaw (*Journal of Laryngology, Rhinology, and Otology*, November, 1905), to which has been awarded the prize offered by Dr. H. Holbrook Curtis to be competed for in 1905 by the members of the American Laryngological, Rhinological, and Otological Society. He discusses the following varieties:

1. Mycosis leptothricea, of which the causative agent is *leptothrix buccalis*.
2. Mycosis sarcinica, of which the causative agent is the variety of *sarcina*.
3. Actinomycosis, the causative agent being the actinomycoses.
4. Mycosis aspergillina, caused by various kinds of *aspergillus*.
5. Mycosis mucorina, the so-called black tongue, produced by certain varieties of *mucor*.
6. Mycosis oïdica, thrush, which is caused by the *oïdium albicans*.

This is a very complete summary of the subject, taking up some twenty-four pages of the journal, and is hardly susceptible of satisfactory abstract.

Pseudoleukæmic Tumor of the Pharynx.—DR. Z. VON LENART reported to the Hungarian Society of Medicine of Buda-Pesth (*Revue Hebd. de Laryngologie, d'Otologie et de Rhinologie*, November 11, 1905) a tumor the size of an egg in the upper part of the pharynx of a man aged forty years who had suffered for a year with progressive nasal obstruction and noises in the ear. It was of a bluish-red color, covered with smooth mucous membrane, and occupied the entire right nasal fossa and, in part, the left one likewise. Lymphatic glands were hypertrophied all over the body and the spleen was enlarged. The examination of the blood showed considerable increase of leukocytes, and the hæmoglobin equalled 70 per cent. There was no sign of tuberculous bacillosis. Histological examination of a fragment excised showed typical lymphoid tissue.

Saddle Nose.—In reporting to the American Medical Association a case of transplantation of bone for the relief of saddle nose (*Journal of the American Medical Association*, November 11, 1905) Dr. Cullen F. Welty, of San Francisco, reviews the subject of paraffin injections and plastic surgery for the relief of this deformity and decides in favor of the latter. In his own case he transplanted a section of bone from the crest of the tibia, with fair amount of success as to improvement in looks and complete success as a surgical procedure. Though this plan was original with Dr. Welty he unwittingly followed a device which had been satisfactorily practised before by Dr. Israel.

Suppuration in the Accessory Sinuses of the Nose.—DRS. C. J. LEWIS and A. LOGAN TURNER present (*Edinburgh Medical Journal*, November, 1905) a careful and thorough bacteriological and clinical research into this subject which deserves close study. They summarize their conclusions as follows:

1. That the organisms found in the healthy nasal cavities belong to the same varieties as those occurring in abnormal conditions of the nose.
2. That the pus obtained from some cases of antral suppuration may contain organisms similar to those occurring in the buccal cavity.
3. That occasionally bacilli distinctive of dental caries may be isolated from the pus of an antral abscess.
4. That the healthy accessory sinuses are probably sterile.
5. That there are three main types of organisms commonly met with in suppuration of the accessory sinuses, namely, streptococci, pneumococci, and staphylococci.
6. That in the cases of chronic suppuration streptococci were found in 80 per cent., whilst in the more recent cases they occurred in 60 per cent.
7. That the swabs taken directly from the affected cavities provide from the bacteriological standpoint more trustworthy results than swabs taken in the same cases from the nasal cavities.
8. That in recent cases virulent organisms are met with twice as often as in cases of chronic suppuration.

9. That clinical evidence supports the view that the antrum is more frequently infected by way of the nasal cavity, and that this opinion is corroborated by bacteriological investigation.

10. That nasal polypi occur more frequently in cases of associated sinus suppuration than in simple cases of antral abscess; their association with ethmoidal cell suppuration, whether occurring alone or as a complication of other sinus inflammation, is evident from the cases quoted.

11. That the recent cases of uncomplicated antral suppuration, as contrasted with those of a chronic type, respond more readily to treatment by lavage.

Radical Operation through the Alveolar Process for the Relief of Chronic Suppuration of the Maxillary Sinus.—PROFESSOR JURASZ, of Heidelberg, reports (*Verhandlungen des Vereins Sueddeutscher Laryngologen*, 1904) three cases in which the alveolar opening was enlarged sufficiently to admit the little finger and permit thorough curetting of the sinus. A dental plate was worn as an obturator until the cures were effected. This treatment he deems especially adapted for cases of chronic suppuration of the sinus of apparently dental origin in which the hard palate is but slightly vaulted and the alveolar process is comparatively thin walled.

DERMATOLOGY.

UNDER THE CHARGE OF

LOUIS A. DUHRING, M.D.,

PROFESSOR OF DERMATOLOGY IN THE UNIVERSITY OF PENNSYLVANIA,

AND

MILTON B. HARTZELL, M.D.

INSTRUCTOR IN DERMATOLOGY IN THE UNIVERSITY OF PENNSYLVANIA.

Pyroxalin in Dermatology.—ALLAN JAMIESON (*Edinburgh Med. Journ.*, May, 1905, p. 433) considers the virtues of this drug (which is oxydized pyrogallie acid) brought forward by Unna. It is prepared by oxydizing pyrogallie acid with a current of air charged with ammoniacal vapor. It is a black powder having many of the properties of pyrogallie acid, but is toxic and irritating. Jamieson has found it useful in psoriasis, keratotic eczema of the palm, tinea tonsurans, and sycosis, employed in 10 per cent. strength in ointment, or in solution in acetone.

The Value of Radium in Cutaneous Diseases.—DANLOS (*Bull. de la Soc. med. des Hôp de Paris*, February 10, 1905, p. 97) thinks the value of this substance is limited to certain diseases, up to the present time in his experience being useful only in tuberculous lupus, pearly carcinoma of the skin, and vascular nævi, and only where these diseases are limited in form. For extensive lesions it is inferior to the Roentgen rays.

Phototherapy in St. Goran Hospital, Stockholm.—MAGNUS MOLLER (*Monatssch. f. prakt. Derm.*, November 1, 1905, p. 449) reports his experience with this method of treatment in various diseases, including seventy-nine cases of lupus vulgaris, seventeen of lupus erythematosus, twelve of carcinoma cutis, three of alopecia areata, and one each of nævus vasculosus and acne rosacea. Not to speak of the excellent results obtained in lupus vulgaris the results were favorable in the infiltrated form of lupus erythematosus (the lupus erythematosus discoides of Kaposi), while but slightly beneficial results followed its use in the superficial forms. In alopecia areata, acne rosacea, and nævus vasculosus distinct improvement took place.

The Action of the Finsen Light on Normal Skin.—F. VON VERESS (*Monatsh. f. prakt. Derm.*, vol. xl, p. 430), from experiments made, concludes that symptoms of acute inflammation are produced, including œdema, blebs, dilatation and thrombosis of the bloodvessels, emigration of leukocytes and lymphocytes; secondly, as to the lesions, vacuolization of the epithelial cells and of the giant cells, degeneration or necrosis of the epithelium, hemorrhage and hyaline degeneration; thirdly, reactionary symptoms composed of proliferation.

Case of Pemphigus Neonatorum Gangrænosus.—W. T. FREEMAN (*Brit. Journ. of Derm.*, October, 1905) states that in the infant there were no symptoms pointing to syphilis as the cause. At birth the infant was said by the midwife to have no skin on the feet and legs, but the presence of blebs with hemorrhagic contents over the general surface permitted the diagnosis of pemphigus. Death occurred on the fourth day, by which date some of the blebs had dried up, others had ruptured, leaving patches of blood-stained corium, which soon took on a gangrenous form. Nine parts out of ten of the eruption existed at birth. The author inclines to the view that the cutaneous manifestation is but a peripheral expression of a widespread central nervous lesion and that the epidemics, if such there be, are caused by a secondary infection of the contents of the vesicles.

The Organism of Dermatitis Coccidioides.—S. B. WOLBACH (*Journ. of Cut. Dis.*, January, 1905) studied a case in Boston, in which the lesions were subcutaneous and situated on the head. The patient had lived in California and Mexico and had travelled much abroad. Cultures of the fungus resembled young colonies of *oidium lactis*, and consisted of a mass of coarse, branching, here and there segmented, mycelia, with a distinct membrane. Old colonies showed an aerial hypha-bearing gonidea and spherical bodies resembling those met with in the tissue. The author states that the organism cannot be considered a blastomycosis.

Multiple Benign Sarcoid.—C. BOECK (*Archiv f. Derm. u. Syph.*, January, 1905) again calls attention to this disease, which he first described in 1899. Five new cases are referred to. The disease is usually papular or nodular, the lesions being usually multiple, the size of a pea or bean, reddish blue or brownish yellow in color, and generally seated on the face. While clinically they resemble somewhat tuberculosis the course of the disease is different, the lesions being

amenable to the internal use of arsenic. Injections of tuberculin do not cause any local reaction. Sometimes the lesions assume a diffuse form.

On Mycosis Fungoides.—ALFRED BRANDWEINER (*Monatsh. f. prakt. Derm.*, November, 1905) describes an unusual case of this disease, and in particular discusses the subject of metastasis. Tumors composed of reddish-yellow nodules, varying in size from a hazelnut to a small apple, were found in the brain. There were no changes observed in the spinal cord. He concludes that this is the first case in which it has been shown that metastasis occurred in the brain; that the histological examination proved that the cells of mycoid tumors do not arise from connective tissue, and that in the light of existing knowledge there is no ground for considering the manifestations of this disease as metastasis of leukæmia, as has been asserted.

Contagion of Leprosy in the Light of Science.—ZAMBACO PACHA (*Annales de Derm. et de Syph.*, May, 1905, p. 460) discusses this important question at length, and believes that it is not properly understood, for the reason that the world is of the opinion that it was extinguished in Europe and that its revival is to be attributed to new importations from leprous countries. In reality, owing to the better hygienic condition of the present time, and causes other than this, leprosy is diminishing by degrees and is tending to disappear. Granted that the bacillus appears to be the principal factor in leprosy, it should not be disregarded that it is insufficient in itself to account for leprosy. The disease ravages those countries where even the strangers are not spared, whilst in another country leprosy is not propagated by those who have contracted the germ in the active centre of the disease. The decadence of the virulence of the bacillus is incontestable, not only for leprosy but also for cholera and plague. The bacillus of leprosy can be wanting or is not demonstrable in certain cases, and the clinician may be able to make the diagnosis against the conclusions of the bacteriologist. Zambaco thinks that the disease is showing no tendency to actual increase, especially in Central Europe.

A Case of Autochthonous Leprosy in the United States.—O. ORMSBY (*Annales de Derm. et de Syph.*, May, 1905, p. 460) relates the case of a man born in Iowa who was the subject of unquestionable tubercular leprosy. His father was a Norwegian, who came to the United States at the age of ten years, and who was probably leprous; he had a sister and probably a brother who were also leprous.

Subcutaneous Injections of Chaulmoogra Oil in Leprosy.—TOURTONLIN BEY (*Monatsh. f. prakt. Derm.*, January 15, 1905, p. 88) states that this method of treating leprosy is distinctly useful if not curative. Other clinicians have also used and reported on Tourtonlin's method, to which he directed attention in 1894. Improvement in some cases follows the fifth injection. The disadvantages of the treatment are that the injections may be painful and may cause elevation of temperature or even pulmonary embolism, but the latter accident is rare. As a rule about five grams are injected, this dose to be repeated every few days or as may be advisable. The remedy, it would seem

from the experiments made, has the power to keep the disease in subjection if not to cure, and hence must be regarded as valuable. The treatment is slow, occupying months or, more often, years.

On the Pathology and Treatment of Leprosy.—ROST (*Brit. Med. Journ.*, February 11, 1905, p. 294) discusses the culture of the lepra bacillus and the production of its antitoxin. The injections of the product (so-called "leproline") caused in lepers an active febrile reaction, a rapid disappearance of the patches devoid of color, and the cure of the ulcerations. In the anæsthetic areas and regions sensibility returned immediately. Amelioration of symptoms followed in all cases promptly, and in four cases there was complete cure of the disease, and in one case after a single injection. The remedy is an extract analogous to the tuberculin of Koch.

Framboesia Tropica.—HENGLE (Dermatologische Zeitschrift, September, 1905, p. 602) gives an interesting article on this disease as met with in Sumatra. He differentiates it very clearly from syphilis (with which disease it has often been confounded). It is a contagious, infectious, autoinoculable disease, with an incubation period and with a great variety of general and local symptoms, the cutaneous being very marked, distinctive, and frequently severe. Potassium iodide and Zittmann's decoction of the woods prove valuable, and sometimes mercury is useful. The chief interest in the paper is its clear separation from syphilis. Its cause is not known.

PATHOLOGY AND BACTERIOLOGY.

UNDER THE CHARGE OF

WARFIELD T. LONGCOPE, M.D.,

DIRECTOR OF THE AYER CLINICAL LABORATORY, PENNSYLVANIA HOSPITAL.

ASSISTED BY

G. CANBY ROBINSON, M.D.

RESIDENT PATHOLOGIST, PENNSYLVANIA HOSPITAL, PHILADELPHIA.

The Latency of Tetanus Spores in the Animal Body.—TAROZZI (*Cent. j. Bakt. u. Parasit. Orig.*, 1906, Bd. xl. p. 451) injected subcutaneously into rabbits modified cultures of the tetanus bacillus containing spores, and found that the tetanus bacilli passed into the blood and were carried to the various organs, where spores could be demonstrated long after the original dose was given. The spores were found most frequently in the liver and there they remained longest. They were not numerous, but could be demonstrated by making cultures from small bits of the organ. Not only were these latent spores visible, but they produced toxin in cultures sufficient to kill rabbits in 1 to 1.5 c.c. doses and guinea-pigs in smaller amounts. The question then arose as to whether it was possible for the spores remaining latent in the body to multiply

and give rise to toxic symptoms. Experiments on rabbits previously injected with weakened tetanus culture showed that if by some means, such as the injection of lactic acid, necrosis of tissue was produced, the animals died with tetanic symptoms. At autopsy many tetanus bacilli were found in the necrotic tissue of the organ injected. The author believes that under these conditions the spores find a suitable medium in the necrotic material for growth and hence produce toxins. He suggests that the so-called rheumatic or spontaneous tetanus in man may be due to the lighting up of a latent infection acquired long prior to the onset of the tetanic symptoms.

Newer Clinico-bacteriological Experiences in Typhoid and Paratyphoid Fever.—BRION and KAYSER (*Deutsches Archiv. f. klin. Med.*, 1906, lxxxv. p. 525) report their experiences with a series of two hundred cases of typhoid and paratyphoid fever. The results of their studies of agglutination reactions and of cultures from the blood, stools, and urine are given. In their agglutinations they consider a reaction of the organisms to the serum in 1:100 dilution as positive. Both macroscopic and microscopic methods were used.

In typhoid fever they obtained a positive agglutination with typhoid bacilli in 50 per cent. of ninety-one cases tested on the eighth day of disease, 84 per cent. of one hundred and twenty-one were positive when tested on the fifteen day, and 95 per cent. were positive on the twenty-second day of the disease. This well shows how the value of the agglutination test as a means of diagnosis increases as the disease progresses. The earliest successful agglutination was on the third day, when three cases reacted positively. In one hundred and thirty-eight positive agglutinations of the typhoid bacillus a group agglutinin was present for the paratyphoid bacillus in about 10 per cent., and for the β -type of paratyphoid bacillus in about 8 per cent. of the cases. Group agglutinins were also found present in infection with both types of paratyphoid bacilli. Mixed infections were ruled out by the isolation of the infecting organism and by absorption experiments. The authors' investigations upon group agglutinins show that by the microscopic method the serum usually agglutinates the infecting organism in higher dilutions than it does the other members of the group, although at times the group agglutinins may be more powerful than the specific agglutinins.

The authors report two cases which gave a positive agglutination for typhoid bacilli in 1:100 dilution, but which clinical, bacteriological, and in one case autopsy findings showed to be infections with other organisms. They also report seven cases which were not typhoid fever clinically but which gave positive agglutination reactions. Two of these cases were in healthy colleagues who had to do daily with much typhoid material. In these cases a latent infection is considered as possible.

Blood cultures were made in one hundred and eighteen cases of typhoid fever. These were successful in sixty-four, or about 55 per cent. of the cases. During the first week of the disease 94 per cent. of the cases were positive, during the second week 70 per cent., and during the third week typhoid bacilli were obtained in 54 per cent. of the cases. The organisms were obtained from the blood eight times

before the agglutination became positive. They were obtained twice on the third day of the disease. The authors consider that no prognostic conclusions can be drawn from the results of blood cultures, although as a rule the blood of the more severe cases contain the greater numbers of organisms.

In their bacteriological examination of stools they found that during the first week of the disease bacilli were obtained in seven cases, only one of which gave a positive agglutination reaction. The organism was found to increase in numbers in the stools, usually gradually, as the disease progressed. At the end of the first week of the disease 32 per cent. of the cases showed the typhoid bacillus in the stools; at the end of the second and third weeks 35 per cent. and 45 per cent. respectively. Of one hundred and fifty-four patients convalescent from typhoid fever 93 per cent. failed to show the bacillus in the stools after fifteen days of normal temperature, while in eighty-four cases the urine was also bacillus-free under the same conditions.

Typhoid bacilli were found in the urine of 25 per cent. of twelve cases examined between the second week and the fortieth day of the disease. The authors found the typhoid bacillus in the stools of six healthy persons, three of whom had never had typhoid fever, but had been intimately associated with typhoid fever patients. The other three cases had had typhoid fever seven, ten, and thirteen months previously. All were women.

In cases that were typical clinically and in which blood cultures and agglutination tests were negative the bactericidal properties of the patient's blood, as suggested by Pfeiffer, sometimes revealed the cause of infection. The authors encountered nine paratyphoid infections in this series of two hundred cases, or 4.5 per cent. of the total number. Seven of them were of the β type and two were of the α type. After they had completed their series of two hundred cases they encountered a γ type of paratyphoid infection, from which the organism was obtained from the circulating blood in pure culture on two occasions. It terminated fatally on the eighteenth day of the disease and is reported with the autopsy findings. Typical lesions of typhoid fever were found, including ulcerations of Peyer's patches. At the autopsy only the β -paratyphoid bacillus was obtained from all the organs, including a small number from the ventricles of the brain and spinal fluid.

One of the cases of α -paratyphoid infection presented a very interesting course. On the tenth day of disease the serum agglutinated the α -organism in 1 to 500 dilution, while the typhoid bacillus was agglutinated only by a 1 to 50 dilution. Only α -paratyphoid bacilli were obtained from the stools. On the forty-first day α -paratyphoid was agglutinated at 1 to 50 dilution only, while both β -paratyphoid and typhoid bacilli were agglutinated at 1 to 100 dilution. On the sixtieth day of disease the α -paratyphoid organism was agglutinated by 1 to 100 dilution, β -paratyphoid by serum diluted 1 to 500 and the typhoid bacillus by serum diluted 1 to 1000. Typhoid bacilli were obtained from the stools and several times from the urine after the sixtieth day. The authors discuss the significance of these findings and favor the idea that a secondary infection with the typhoid bacillus followed an infection with the α -paratyphoid bacillus.

Occurrence of Meningococci in the Nasal Cavities.—GOODWIN and VON SHOLLY (*Journal of Infectious Diseases*, 1906, Supplement No. 2, p. 21) give the results of an extensive bacteriological study of the nasal cavities of patients suffering from epidemic cerebrospinal fever and of persons in contact with such patients.

The authors made cultures from fifty-two cases of meningitis. Of these twenty-two were examined during the first week of the disease, and from twelve cases the meningococcus was isolated. Five positive cases were obtained from fifteen examined in the second week. All later cases were negative except in a severe case where the organism was obtained on the sixty-seventh day of disease. An examination was also made of the nasal secretions of forty-five healthy persons living in close contact with the disease, and from five the meningococcus was obtained. In all of these cases the persons had been intimately exposed, living in the same room with a patient during the first two weeks of the disease. The nasal secretions of fifty-five unexposed first year medical students were examined as a control, and from these in two cases an organism was isolated agreeing perfectly with the meningococcus culturally and in pathogenicity, but showing difference in agglutination reaction.

The cultures were made by removing mucus from the nasal fossæ by sterile cotton swabs and smearing it on plates of aseptic agar.

The organisms were tested by practically all the cultural methods, animal inoculation, agglutination and absorption experiments. Micrococcus catarrhalis and similar organisms were carefully excluded. From their results the authors conclude that as the meningococcus was present in the nasal secretions of about 50 per cent. of patients with meningitis which they examined during the first two weeks of the disease, and in 10 per cent. of healthy persons in contact with these cases, their findings indicate that it is very important to isolate cases of epidemic cerebrospinal meningitis, at least during the early weeks of the disease.

Examination of the Blood for Tubercle Bacilli by Hydrohæmolysis.—NATTAN-LARRIER and BERGERON (*Journ. de Physiologie et de Path. gen.*, 1905, vol. vii. p. 1028) advocate their method of hæmolysis by water as the best-known method for finding tubercle bacilli in the circulating blood. They put 100 c.c. of recently distilled water into two sterile flasks, to each of which is added 5 c.c. of blood drawn from the arm vein. The flasks are then shaken three or four minutes and a fluid devoid of fibrin or coagulum is obtained. The fluid is then centrifuged and the sediment spread on slides and examined or it may be put upon culture media by means of sterile pipettes. Twelve parts of water to one of blood may be used in animal experiments instead of twenty to one, when human blood is employed.

This method was used by the authors in a series of experiments. They injected into the ear veins of rabbits emulsions of tubercle bacilli and then examined the blood for the organism. They found the organism in the blood fourteen out of fifteen times during the first five days after inoculation, but only twice was the search successful after five days had elapsed: once on the seventh and once on the ninth day. They were able also to grow the tubercle bacilli from the blood by their method.

The authors state that their procedure does not deform the tubercle bacilli, a fault which may be found with some of the other methods.

Bacteriology of Whooping-Cough.—DAVID J. DAVIS (*Journal of Infectious Diseases*, 1906, vol. iii. p. 1) carefully reviews the existing conceptions in regard to the etiological role of various micro-organisms in whooping-cough. Although there is great lack of unity in results arising chiefly from a diversity of methods, the author believes that practically all modern investigators have been dealing either in pure or in impure cultures with the influenza-like bacillus first described by Sprengler and later by Jochmann.

Davis made bacteriological examinations of the sputum of eleven cases of pertussis and was able to isolate an organism which he could not differentiate from the influenza bacillus in fifty-six cases, or in 92 per cent. The organism showed a low degree of virulence for laboratory animals, although a general bacteremia and death were produced when large amounts of the organism were inoculated intraperitoneally. The virulence was increased when inoculated with non-virulent strains of staphylococcus pyogenes aureus and other organisms. This symbiotic effect the author considers quite important in the etiological role of the organism.

Inoculation of the throats and nasal cavities of monkeys had no effect. The organism obtained from pertussis cases was smeared on the tonsils and nasal mucosa of a healthy young man and a definite reaction followed. About forty-eight hours after inoculation the patient had chilly sensations, a cold sweat, some headache and weakness, and his temperature rose to 100.2° F. The febrile reaction continued for about two days. This was followed by a somewhat indefinite pharyngitis with cough for about four weeks. The cough was not, however, spasmodic and whooping did not occur. This experiment proves, the author thinks, that this influenza-like organism is at least not always a harmless saprophyte.

The throats of numbers of patients suffering usually with the diseases of childhood were examined, and a similar organism was found in from 18 to 80 per cent., varying with the disease. It was also isolated twice in cultures from the throats of twenty healthy medical students. The author believes that this bacillus cannot as yet be sufficiently differentiated from the influenza bacillus to warrant another name for it.

Although Davis considers that evidence at hand will not permit a definite statement for or against the specificity of the organism for whooping-cough, it is certainly very frequently found in the sputum of whooping-cough patients, especially during the spasmodic stage of the disease. It has been found several days before the whoops began and as long as six months after the disease. The work, together with that of Jochmann, Wollstein and others, certainly suggests that the final solution of the cause of whooping-cough will be found in the group of organisms to which the influenza bacillus belongs.

Multiple Non-inflammatory Necrosis of the Liver.—OERTEL (*Journal of Experimental Medicine*, 1906, vol. viii. p. 103) describes a peculiar type of necrosis of the liver which he has observed four times in two hundred and seventy-five autopsies. In the gross the liver appears

pale, the markings are lost, and the surface presents circumscribed deep yellow or hemorrhagic spots and streaks. Microscopically, irregular areas sometimes forming streaks were seen, in which the liver cells were destroyed. The necrosis was general. The distribution of the single areas varied, sometimes being found about the central vein of the lobule, sometimes about the periphery. In these foci, which were often circumscribed, but at times had no definite margins, the liver cells presented various grades of necrosis without inflammatory reaction. The outlines of the cells were well preserved. The nucleus showed all stages of fading to complete disappearance. The cells contained many bile granules and fat droplets. In the areas where the process was more advanced the liver cells had undergone complete dissolution, leaving only a shadow or an empty space with the surrounding reticulum. In all the cases there was more or less portal sclerosis. The condition differs altogether from the ordinary parenchymatous degeneration or coagulation necrosis of cells. The author excludes a postmortem change and suggests that the necrosis is caused by an autolysis of the liver cells; and since the lesion cannot be classified with the known forms of necrosis of the liver, it must be considered as a new type hitherto undescribed.

Changes in the Pancreas in Cirrhosis of the Liver.—LANDO (*Zeit. f. Heilk.*, 1906, Bd. xxvii. p. 1) has studied the pancreas in twenty-three cases of cirrhosis of the liver. In most instances the cirrhosis was of atrophic type and in fifteen cases there was a history of alcoholism. Diabetes was present in three instances. The pancreas in all cases showed more or less overgrowth of connective tissue which in twelve cases was about proportionate to the cirrhosis of the liver. The pancreatic cirrhosis was at times entirely intralobular and confined to the interacinar connective tissue; at other times the increase was principally in the interlobular connective tissue, though in this type there always existed some increase in the intralobular connective tissue too. The head and tail of the pancreas seemed to be affected first and exhibited the most extensive changes. In a case of pigmentary cirrhosis of the liver there was also marked pigmentation of the pancreas. The islands of Langerhans presented usually some alterations which, however, except in the cases of diabetes, were marked neither in degree nor extent and consisted in slight thickening of the capsule or vessels and degenerative changes of the epithelium. In two of the cases of diabetes there was hyaline degeneration. Increase or thickening of the elastic tissues of the organ was often noted. The weight of the pancreas varied from 32 to 150 grams. The form of the cirrhosis, whether atrophic or hypertrophic, made no difference in the microscopic picture of the changes in the pancreas. Two principal causes for the lesions in the pancreas are discussed. It is possible, first, that the changes in the pancreas may be the sequence of a chronic passive congestion following the cirrhosis of the liver; or, secondly, the etiological factor in the production of the cirrhosis of the liver may also be the cause of the changes in the pancreas. In most of the cases the author adopts the latter view, regarding alcohol as the etiological factor. In a few instances he believes that the pancreatic lesion followed directly from the cirrhosis of the liver.

The Spinal Changes in Polyneuritis of Tuberculosis. Though the literature upon polyneuritis in tuberculosis is rather extensive, comparatively few observations have been made upon the condition of the spinal cord in this disease. TAUBER and BERND (*Zeit. f. Heilk.*, 1905, Bd. xxvi. p. 371) report the results of a study of 13 cases of well-marked polyneuritis occurring in pulmonary tuberculosis. Eight of these showed very definite alterations in the spinal cord and six slight changes. Cases of tuberculous meningitis were excluded, as well as those instances in which inflammations in the nerve were directly associated with a tuberculous process. The symptoms of neuritis usually come on gradually and seldom developed acutely. In the majority of the cases the peroneal nerves, usually on both sides, were affected. Involvement of the radial nerves was rarer, though in a few cases all four extremities were affected. The clinical symptoms in the cases described were typical. Examination of the spinal cord by the Marchi method and other techniques showed a very definite degeneration affecting systems of nerve tracts. The seat of this degeneration was usually in the posterior columns and involved in the majority of cases the column of Goll, although occasionally the columns of Burdack were also diseased. Together with these changes there was a degeneration of the posterior nerve roots, almost always more pronounced in the lumbar region than in the cervical portion. A comparison of the extent of the lesions in the posterior nerve roots and posterior columns showed certain incongruities in the relationship, so that an ascending degeneration and dependence of one lesion upon the other could not always be demonstrated, though in certain instances the changes were such that it seemed permissible to conclude that an ascending degeneration had taken place. The anterior roots were rarely degenerated. In only one specimen was there a degeneration of Schultz's comma tract. In one or two cases old degenerations were found in the pyramidal tracts, and once the direct cerebellar tract was involved in the cervical region. The extramedullary portions of the posterior and anterior nerve roots were found free from pathological alterations in all cases.

The authors conclude that the spinal-root changes are more extensive than would be necessary to explain the disease of the nerves clinically.

The spinal-cord changes are fully co-ordinate with the changes in the peripheral nerves. Polyneuritis of tuberculosis is a disease which can affect the entire nervous system.

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SPECIAL ARTICLE.

VASCULAR TENSION IN CHRONIC ILLNESS.

BY HOBART AMORY HARE, M.D.,

PROFESSOR OF THERAPEUTICS IN THE JEFFERSON MEDICAL COLLEGE OF PHILADELPHIA;
PHYSICIAN TO THE JEFFERSON MEDICAL COLLEGE HOSPITAL.

THIRTY years ago, the study of disease of the vascular system scarcely did more than cover the lesions of the valves of the heart, a consideration of gross lesions in its muscle, and a brief reference to the grave changes found in the bloodvessels when they were affected by marked fibrosis or atheromatous change, or became plugged by emboli or thrombi. Little attention was paid to the changes in the finer arterioles except when these changes were well developed, and nothing was said of the functional state of the arterial system in its relation to circulatory disorders. Nearly all the treatment advised was directed to the heart itself, and the importance of the vasomotor system as a factor in disease was almost ignored. At the present time, however, medical men in general have come to recognize the fact that a vascular system intact, both functionally and anatomically, is essential not only to the health of the body in general but of the heart in particular. Not only may serious consequences to the heart follow the development of arteriocardillary fibrosis, but, in addition, mere spasmodic contractions of the arterioles, to a degree in excess of the normal, may be disastrous in acute conditions; and the antithesis of spasmodic contraction, namely, vascular relaxation, may result in speedy death, either by bleeding the man into his own vessels, or by causing cardiac exhaustion in the endeavor of this organ to fill the relaxed vessels. The object

of these remarks, therefore, is to emphasize the importance of studying the vascular state and the degree of the blood pressure in respect to the diagnosis, prognosis, and treatment in several states of disease, and they are called forth because a fairly large experience has convinced me that many medical men are still impressed with the idea that a tired heart should be stimulated to greater effort when in reality it should be given as much rest as possible by diminishing its burden. I believe that this is one of the grave mistakes in modern diagnosis and treatment.

If we take, as an example, any one of the grave infectious diseases characterized by toxæmia, we find that the heart fails, if it fails at all, as a result of poisoning of its muscle or disorder of its nerve supply arising from the same cause, and against this muscle poison our stimulants do not act as true antagonists. The longer I study these cases the more I am impressed with the fact that active cardiac stimulation is often more harmful than advantageous, unless we can resort to measures designed to diminish the toxæmia, and by decreasing the toxæmia permit the heart to do its work. As a matter of fact, the vascular system in these cases shows, if it be carefully studied, that it is much more responsible for the circulatory depression which is present than is the heart, and an examination of the patient's vessels will reveal the fact that they are widely dilated, and of the heart that it is working more actively and more forcibly than in health in an endeavor to fill the relaxed arterioles. The patient's death is doubtless imminent because of circulatory failure, but the heart, in a considerable portion of cases fails only when it is tired out in the vain attempt just alluded to. To use a simile which I have used before, the heart under these circumstances may be compared to a locomotive on a slippery track. It fails to push its load not because it is weak, but because it finds no resistance on the rails. The more the locomotive is stimulated to increased endeavor by opening the throttle wider and wider, the more it shakes itself to pieces, the more it expends its energy, and it gains nothing. The heart is designed to beat against a very considerable arterial tension, just as the locomotive is required to work against a given load; but here the simile ceases, for the locomotive gathers no strength from the friction or resistance of the rails and train, whereas the heart depends absolutely for its existence upon such resistance, because if the arterial pressure falls the heart muscle gets less blood through its coronary arteries and through the vessels of Thebesius. A very low tension, therefore, means an increased but worthless expenditure of energy and a decreased nutritive supply to the overworked muscle fibres. Fortunately most of the drugs commonly used by physicians under these conditions are, as a matter of fact, both cardiac and vascular stimulants, and so the patient gets the needed vascular effect.

It is quite remarkable how competent the heart is to attend

to its functions if the physician is able to overcome vascular relaxation. There are only three drugs which have seemed to me to be competent for this purpose, namely, atropine, adrenalin, and digitalis, and I have placed them in their order of usefulness: for atropine by contracting the great vascular areas of the abdomen raises arterial pressure everywhere and, according to Hedborn, dilates the coronary vessels, and so increases the cardiac blood supply without directly stimulating the heart muscle to increased endeavor.

Two states of deleterious high tension are also overlooked, namely, the high tension of acute illness and the high tension of prolonged nervous and mental stress. The high tension of cases of acute illness rarely approaches the high tension characteristic of arteriocapillary fibrosis for obvious reasons, and so is not so readily recognized by the physician who is careless of this aspect of his patient's case; but, nevertheless, it is important for us to recall that its modification is much more advantageous than the very popular efforts to reduce fever, which is an associated symptom of comparatively little importance. Whether the high tension occurs early in the illness or at a later stage, vascular relaxants, which are not cardiac depressants, will save the heart from the expenditure of a large amount of unnecessary effort, and thereby enable it to withstand calls upon its reserve energy.

I wish to call attention to only two more points in regard to this matter of high arterial tension in acute disease, namely, that physicians often, in their terror of cardiac failure, give circulatory stimulants when a comparison of the patient's pulse force and tension with that in their own vessels will show that their own circulation, although normal, is at a lower ebb than the patient's, and by giving stimulants when fever is already causing excessive cardiac and arterial activity, they place themselves in the position of the man who beat his horse into a run for fear he would give out before he got to the end of the journey.

The second point is that our forefathers, while they were empirics, were often more skilful in these cases than many so-called scientific moderns, for they gave vascular relaxants in the form of spirit of nitrous ether, which is, after all, like nitroglycerin in its effects, and Dover's powder, which produces similar influences.

The subject of arterial spasm or fibrosis in its relation to cardiac failure, in those who are subjected to mental strain, is too large a field to be discussed at this time, although it is more important than any of the fields already spoken of. I have recently discussed it at length elsewhere.¹

To express the matter briefly we meet with three classes of cases of high arterial tension of this type: (1) Those in which persistently high tension is a result of spasm due to prolonged nervous stress

¹ *Therapeutic Gazette*, December, 1905.

combined with certain abuses as to habits of life, food, and drink. (2) Those in which tension is high because in addition to spasm there is gradually developing, or has already developed, fibroid changes in the vessels. (3) Cases in which, after a prolonged period of high tension, there, more or less suddenly, develops persistent low tension in which the arteries are relaxed and distended, so that, to some degree, they resemble veins in their calibre and compressibility.

In the first and second classes rest in bed, with massage and the nitrites, is essential. In the third class the rest in bed is needed also, but vascular stimulants are required. In all these cases the iodides are valuable. If the high tension is due chiefly to spasm, nitroglycerin will do good for obvious reasons, but it will fail to a great extent if the condition is due to fibrosis. This is an important therapeutic point, showing that the physician can expect nitroglycerin to reduce only that part of the hypertension which is due to spasm and not that part due to fibroid change. The latter stage is largely beyond the influence of medicinal agents, unless it be the iodides. On the other hand, the combined effect of rest, massage, and iodides will often, even when fibrosis is well developed, not only produce excellent results, in that the state of a tired heart is improved, but also result in a marked diminution of arterial tension, partly by a cardiac and partly by a vascular influence.

There is still another class of cases in which high arterial tension is present which deserves notice, namely, those persons of somewhat advanced years who have gradually developed a high tension of moderate degree, and to this tension the heart, vessels, and tissues have become adjusted, so that it has become a "standard tension," so to speak. With the onset of an acute illness the physician may find this standard tension somewhat exaggerated, and, impressed with the general principle that a high tension is evil, he proceeds to lower it to normal instead of to the new normal standard of the individual under observation. This is usually unwise, and each patient must be studied carefully in this respect.

Finally, let me sum up the points which I am desirous of presenting to the clinician:

1. Cardiovascular stimulants are often given when vascular relaxants are really needed.
2. More attention to the protection of the heart from unnecessary labor is advisable.
3. If the physician will direct his treatment to the vessels the heart will often be able to care for itself.
4. Do not stimulate a heart to increased effort when the real object is to decrease its burden and to diminish the toxæmia which is destroying its function.

ORIGINAL ARTICLES.

**THE THERAPEUTIC USE OF TUBERCULIN COMBINED WITH
SANITARIUM TREATMENT OF TUBERCULOSIS.¹**

By E. L. TRUDEAU, M.D.,

DIRECTOR OF THE ADIRONDACK COTTAGE SANITARIUM, SARANAC LAKE, NEW YORK; PRESIDENT
OF THE AMERICAN ASSOCIATION FOR THE STUDY AND PREVENTION OF TUBERCULOSIS.

THE wild enthusiasm which greeted Koch's announcement in 1890 of his discovery of tuberculin and his claims for its diagnostic and therapeutic possibilities was, as you know, very soon followed by bitter denunciations of the proposed method of treatment, and even of the distinguished scientist himself. Tuberculin was soon abandoned, and for a long time was considered as so dangerous that its use was looked upon as akin to malpractice. A few physicians, however, both here and abroad, continued the study of its careful application to cases of pulmonary tuberculosis, and of late more frequent publications on this subject point to renewed interest in the employment of some sort of vaccine as an immunizing agent in this disease.

So general and bitter was the condemnation of tuberculin that between 1891 and 1900 it was with the utmost difficulty that I could persuade a few patients at the Sanitarium each year to take the treatment while in the institution. As I have, however, used tuberculin injections continuously, though at times in a limited number of cases only, at the Sanitarium ever since 1890, I have thought that a summary of the impressions I have gained from my experience might prove of interest. Dr. Lawrason Brown has already published a detailed report of the cases treated at the Adirondack Cottage Sanitarium up to 1903. I shall not attempt to review the extensive literature of the subject, to discuss lengthy statistics bearing on the comparative results, or to go into a detailed history of cases, but will merely confine myself, as far as possible, to my own experiences, and briefly state my impressions of this method of treatment.

As a diagnostic agent, the tuberculin test has been used at the Sanitarium occasionally for the past fifteen years. So far as its danger is concerned, my observation has been that when given according to the well-recognized rules which alone make its administration justifiable I have never known any ill effects follow the test beyond occasionally a somewhat severe or prolonged reaction, except possibly in three cases, which were somewhat unpleasant experiences. One occurred in the practice of another physician, and two were at the Sanitarium. In the first case there was constitutional impair-

¹ Read at the meeting of the National Association for the Study and Prevention of Tuberculosis, Washington, D. C., May 17 and 18, 1906.

ment, without any marked physical signs, and a test injection of old tuberculin resulted in a moderate reaction, which subsided, but was soon followed by an aggravation of all the symptoms, and I believe the patient ultimately did badly. The other two cases were at the Sanitarium. In one case, a slight hemorrhage followed the first reaction two weeks after its subsidence, but there was no other ill effect. In the other, after four days of normal temperature following the first reaction, blood-spitting occurred, and an exacerbation of all the symptoms, with marked fever, followed and continued for some time. Whether these occurrences were merely coincidences, or were due directly or indirectly to the tuberculin, it is difficult to be certain.

Picket, who recently injected 929 patients, in order to confirm a diagnosis of pulmonary tuberculosis when the bacillus was absent, saw quite prolonged disturbance of the patient's condition follow in three cases, while in twenty the reactions were "more violent than desirable." At the Sanitarium the test has been of great value in helping to reach a conclusion as to the absence or presence of tuberculosis, especially in closed tuberculosis, or when the tuberculous nature of a pulmonary lesion was in doubt; a conclusion which, in the great majority of cases, has proved to be correct and of inestimable value to the patient.

The tuberculin test should never be resorted to until the physician has failed to reach a conclusion after a careful application of the clinical methods of diagnosis. As our skill in the detection of closed tuberculosis increases, it may be necessary to use the test only in exceptional cases, as the reactions at best are sometimes an unpleasant experience for the patient. On the other hand, the more we realize how really curable closed tuberculosis is the more valuable becomes a method which reveals its presence when all other clinical means fail.

I have persisted in the study of tuberculin treatment at the Sanitarium, not on account of any immediate brilliant results noticed in its application, although I saw enough of its effects to encourage me to persevere in its use; but principally, in spite of the popular clamor against it, because it is based on a certain degree of success demonstrable in animals by the experimental method, and because the production of artificial immunity by the specific poison of a disease is the line along which success has already been attained, and is being attained, in other infectious diseases.

The experimental evidence on which tuberculin treatment is based is not as complete or satisfactory as one would wish. Koch gave no details of the method by which he attempted to immunize and cure guinea-pigs with old tuberculin, T. R., or Bacillen Emulsion, but merely states that they can be rendered resistant to subsequent inoculations, and that when treated by these products, their lesions show marked evidence of fibrosis. His associates published details

of experiments, but the results, although encouraging, did not show complete cure or immunity. Other observers have reported a varying degree of success in the immunization of small animals, and in their treatment by bacillary products. Broden,¹ perhaps, gives one of the most detailed descriptions of the good results which he obtained in dogs injected with the filtrate of liquid cultures, both before and after intraperitoneal inoculation, and demonstrates the curative influence of tuberculin as shown by a comparative microscopic study of the lesions of the treated and the untreated animals, as well as by the survival of the former and the death of the latter. Pathological observations bearing on the microscopic appearances of the lesions of patients who have been treated successfully with tuberculin, and have died of other causes, would be of great value at present.

The most convincing evidence of the favorable results of tuberculin that my own experimental work has shown me, I obtained and published as early as 1892. By treating tuberculous iritis in the rabbit's eye by subcutaneous injections of the unheated filtrate of bouillon cultures of the tubercle bacillus, a retrogression of the lesion and an apparent healing gradually took place, which, however, ultimately relapsed somewhat, though very slowly. I have found that guinea-pigs and rabbits previously injected with dead tubercle bacilli live on an average somewhat longer than control animals when subsequently inoculated. The beneficial influence of treatment of small animals with various products of the tubercle bacillus, however, is demonstrated, not by the cure of a progressive generalized tuberculosis in them, for this does not occur; but by the evident tendency to healing shown in localized tuberculosis, and in the more chronic course of the disease in the treated as compared with the untreated animals.

The immunity obtained by non-living products of the tubercle bacillus, however, is only relative, and is not to be compared to that which I have been able to produce by preventive inoculations of living attenuated cultures. Behring's experiments of cattle immunization thus far published show the same thing, namely, that he obtained no solid immunity in cows with various *non-living* tuberculous products, but that he achieved success and produced a solid immunity by previous inoculations of living human cultures. All these experiments establish for tuberculosis, by unquestionable evidence, the principle of artificial immunization, hitherto looked upon as impossible of achievement.

Animal experiments, therefore, on which tuberculin treatment in man is based, show that tuberculin immunity is not identical with immunity to tuberculosis, for it does not protect animals abso-

¹ Recherches sur l'histogenèse du Tubercle et l'action curative de la Tuberculine. Archiv. de Médecine Experimentale, January, 1899.

lutely against inoculation tuberculosis, nor materially retard the course of generalized tuberculosis. It would seem that contact between the living bacillus, or the product of the living bacillus, and the cell, is necessary to the production of a solid and lasting immunity, for up to the present this immunity to tuberculosis or to other bacterial diseases has been accomplished in animals only by protective inoculations of a living germ. Behring, however, in his recent announcement claims to have discovered a successful method of immunization for cattle without the use of living bacilli.

Nevertheless, tuberculin immunization, even in the most susceptible animals, undoubtedly prolongs life somewhat, retards the development of the disease in its earlier stages, and produces changes in the lesions which demonstrate an attempt at healing, and this, in localized tuberculosis, may be equivalent to a more or less complete cure. The limitations of tuberculin in the treatment of experimental tuberculosis in animals should, therefore, be borne in mind in judging the results of tuberculin treatment in human beings. Why should we expect it to do more for man than it can accomplish in animals?

To what extent, if any, does tuberculin immunization induced in man favorably influence the course of human tuberculosis? From the renewed interest in this form of treatment it seems that the claims of this method are soon to be thoroughly and dispassionately settled.

Most of the proposed tuberculins have been tested at the Sanitarium. The first used was Koch's original tuberculin. Later, after the publication of Hunter's work in 1891, I made his Modification B., myself, from the filtrate of liquid cultures. The albumoses contained in the unheated culture medium, having been precipitated with ammonium sulphate, were taken up in distilled water and dialysed, Hunter claiming more local and less general reaction from this product. This preparation was used at the Sanitarium for a time. In 1898, Buchner's Tuberculo-plasmin, and in 1900, Landmann's Tuberculol, were both tried, as well as Koch's T. R., and since 1901, Koch's Bacillen Emulsion has been principally used; but Koch's three tuberculins have been most generally employed.

The use of these preparations gave rise to symptoms which were nearly identical, and are the well-known ones of tuberculin reaction. It has been impossible to reach any conclusion as to the relative therapeutic value of these different preparations. Koch's T. R. and Bacillen Emulsion seem to be more uncertain in their action, and to produce more frequently strong and unexpected reactions. This is a serious objection to their use, as occasionally unexpected and pronounced reactions occur, even if the dose is increased with the utmost caution. The reason for this undoubtedly, to a great extent at least, lies in the fact that they are mostly emulsions and not solutions; that absorption of such a suspension is much

more difficult and uncertain than that of a readily soluble toxin; and that unless great care is exercised in thoroughly shaking the bottles, and in drawing from the centre of the liquid rather than the top or bottom, the dilutions made will contain very varying amounts of the suspended but undissolved bacterial substance.

Reasoning from analogy and from what we know of artificial immunization in other bacterial diseases, tuberculins in the preparation of which no heat has been applied are likely to be the most efficient. Koch's Bacillen Emulsion, and the filtrate of ripe cultures as used by Denys, meet this requirement. The first contains all the toxins and endotoxins to be found in the bodies of crushed tubercle bacilli; the second, the toxins and any other substances which may be produced by the growth of the bacilli, or dissolved from their disintegrating bodies in a liquid medium, and both are entirely unaltered by heat.

It is possible that the chemical researches of de Schweinitz, Levene, Behring, Ruppel, and others, exhaustive as they have been, may be carried still further, and that organic chemistry may yet produce a more efficient tuberculin by the elimination of certain substances which are injurious, and the retention of others which are immunizing. But Koch's long and careful work in this direction is suggestive, for after prolonged investigations which resulted in his T. R. tuberculin, he has more recently put forth his Bacillen Emulsion, which is merely a suspension of crushed tubercle bacilli, and contains entire and unaltered all the toxins contained in the bodies of the bacilli. Behring's announcement, on the other hand, is full of encouragement. His T. C. is a toxin which differs from Koch's T. R. principally in its freedom from the waxy elements contained in the bodies of the bacilli, and it is possible it may prove to be a more efficient tuberculin than any we now possess. From what we may infer from Behring's guarded and enigmatical utterance, he has gone even further, and it would seem that he has succeeded in transforming by contact with the living cell his T. C., which is a toxin, into his "Tuberculase," which is an immunizing and curative substance capable of immediate absorption by the cells of susceptible animals and man, and thus producing the desired immunity. Dr. Theobald Smith, as a result of his recent studies on animals, suggests virulent uncrushed tubercle bacilli, killed by moderate heat, as the best vaccine to be tried in attempts at immunizing human beings.

With a few exceptions, in which, soon after Koch's discovery, tuberculin was given as a last resort to far advanced patients who begged to be treated, the patients selected for treatment at the Sanatorium have belonged to the incipient and advanced class, who were mostly apyretic, or whose temperature at irregular intervals reached only from 99.5° to 100°, and whose general nutrition was good. The acute types, or those suffering from marked febrile

remission or hectic fever, were excluded. Patients running a continuous temperature, even if not above 100° , with little to be heard in the lungs, but with rapid pulse, emaciation, debility, and cachexia, pointing to scattered miliary tuberculosis, were also excluded. Elsassar, Denys, and others advocate the use of tuberculin injections even in acute febrile cases, but I have had no experience with such cases.

For a long time the tendency was to choose as favorable cases as possible, from both the incipient and advanced classes, for treatment; but little by little less favorable cases were selected, and during later years those whose condition seemed to be at a standstill, and to have but little chance of arresting their disease by the hygienic and open-air method alone, have been frequently treated. It cannot be denied, however, that the desire to select, from whatever class, patients whose nutrition was good, prevailed to a greater or less extent, and must have somewhat influenced the results.

The first impression which the physician receives who begins to make use of tuberculin is a most profound respect for the tremendous potency of this toxin. A toxic substance which, in so infinitesimal a dose as the one five-thousandth of a milligram of the solid substance contained in Koch's Bacillen Emulsion, may produce typical and marked constitutional disturbance in the tuberculous individual, is certainly not to be used heedlessly, and is potent for evil if carelessly administered. I would not urge any physician who prizes his peace of mind to embark on the treatment of tuberculosis by this method unless he is prepared to begin with minute doses and increase with the utmost caution. He will also soon be made to feel the deep-rooted prejudice which exists, both in the profession and laity, against tuberculin treatment, and he must be prepared to meet criticism and blame for all the exacerbations and complications which naturally develop in the course of the disease, and which are invariably attributed not to the disease but to the treatment; while coincidences will occur occasionally which make his position indefensible, and which he must be prepared to face as best he can. I have seen tuberculous meningitis, hæmoptysis, and uncontrollable pyrexia, all ending fatally, occur in patients who were about to take tuberculin, but for some reason or other did not take it.

The method of administration is of the greatest importance, and has varied as time passed. At first little attempt was made to avoid reactions, which were advised by Koch, and which he still seems to consider as necessary to success in this form of immunization, for in his last paper on Bacillen Emulsion he says: "One increases the dose very rapidly in order to obtain very pronounced reactions, with elevations of temperatures of 1.5° to 2° C. As soon as a strong enough reaction is obtained, the intervals must be lengthened to from six to eight days or more."

From my own experience with tuberculin I have formed the impression not only that fever reactions are not necessary to obtain good results, but that although occasional moderate reactions are unavoidable and apparently do no harm, every effort should be made to avoid them. If frequent and violent, they have a bad effect on the patient's general condition, and are by no means free from danger, as was shown during the early history of tuberculin treatment, the danger being the production of continuous fever, cachexia, and increased activity in the disease.

If we abandon the view that fever reactions are necessary to obtain results, and look upon them as the result of overstimulation; if we accept as a working theory that any curative influence of tuberculin is due not only to a local reaction of the lesion but also to a stimulation of the body cells by the injected toxins—a stimulation which results in the production of some sort of anti-body by these cells, as well as possibly an increased activity of the phagocytes—the best method of treatment would undoubtedly be to continue this stimulation by minute and very gradually increased doses for as long a period of time as possible. Whatever reactions unavoidably occur are only to be considered as indicating that the limit of the patient's capacity for responding, by the formation of antitoxic or antibacterial substances, to the stimulus of the injections has been exceeded.

We must divest our minds of the impression that because small doses produce no immediate apparent effect they are, therefore, ineffectual, for we have ample evidence to the contrary. A minute amount of tuberculin, which produces no rise of temperature when injected in rabbits with tuberculous iritis, nevertheless is capable of bringing about a very appreciable local reaction and leukocytosis. The same occurs in tuberculous nodes and lupus, and the work of Wright and Douglas proves that minute doses, and a very gradual increase, are met by a very appreciable and easily demonstrable response of the defensive resources of the living organism.

The best method has seemed to me to begin with very minute doses—1/10,000 or even 1/20,000 of a milligram of solid substance Koch's Bacillen Emulsion, or a 1/100 of a milligram of old tuberculin—and increase so gradually and at such intervals as to carry the patient to full doses with as little disturbance as possible; and by taking sufficient time, most patients can be taken through the entire treatment with but occasional and moderate reactions. At the slightest evidence of intolerance, as manifested not only by the patient's temperature, but by his symptoms, by marked irritation at the site of injection, or depreciation of his general condition, the intervals between the injections should be lengthened and the dose diminished for a time. Care should be taken never to inject after a reaction until all effects of the previous reaction, both on

the patient's temperature and general condition, have entirely passed away. I have also formed the impression that the treatment should be extended over as long a time as is needed to avoid reactions, no matter how long that may be, and that time is an important element in obtaining the best results. Six months of treatment is almost always necessary, and a year or more would be better in many cases.

The patient, while taking the injections, should show no depression of general health, and should have no fever above his usual temperature range, except it be occasionally for the forty-eight hours following an increase of dose; if this occurs the treatment should be discontinued, and only resumed when he has recovered his normal condition. If full doses, that is, 1 c.c. of old tuberculin, or 5 milligrams of solid substance Bacillen Emulsion, can be reached without violent reactions and without depreciation of the general health, *but not otherwise*, the injections should continue until one full dose has been given; but the intervals should be lengthened gradually as the higher doses are reached, and extended to two weeks between the last two or three injections. The physician must, of course, individualize, and be guided throughout the treatment, and in his judgment *as to the dosage to which it is to be carried*, entirely by its effect on the patient; and on his watchfulness and skill will greatly depend the safety of the patient and the degree of success attained.

I quite agree with Denys that the principal faults in treatment—faults which may lead to failure, and even seriously endanger the patient's chance of recovery—are:

Beginning the treatment with too large amounts; raising the dose too rapidly or at too short intervals; injecting again before all effects of a reaction, both constitutional and local, have passed away; increasing the dose after a reaction has occurred; neglecting to consider malaise, headache, loss of appetite, and increased cough, as evidences that the limit of the patient's tolerance has been reached, and calls for an interval of rest and a reduction of the dose. The physician who disregards as of no importance an increase of a minute fraction of a milligram of tuberculin, or a rise of a few tenths of a degree of temperature, will meet with disappointment and disaster in the application of tuberculin treatment. I have become convinced that any danger there may be of aggravating the patient's condition by tuberculin treatment lies principally, if not wholly, in its faulty or reckless administration.

Tuberculin immunity does not last indefinitely, and it may be well for the patient to take another course of treatment in four to six months if any symptoms should reappear; but with a very few exceptions the patients at the Sanitarium have taken but one course of injections.

The serum agglutination method, as proposed by Koch, has not

been found reliable either as a guide to dosage or as an indication to the degree of immunization produced by tuberculin.

The most interesting work of Wright and Douglas on the production of opsonins in the blood, the presence of a positive and negative phase in artificial immunization, and finally the application of the opsonic index as an accurate guide in regulating the doses of vaccine and intervals between injections, is a brilliant contribution to our knowledge of the mechanism of artificial immunization, and a striking attempt at the practical application of exact laboratory methods to the treatment of disease. It is to be regretted, however, that even if the deductions Dr. Wright draws as to the necessity of being guided by the rise and fall of the opsonic index, and even if the accuracy of his method of determining it should be confirmed, the degree of skill required in carrying out such delicate technique and the time and work necessary in the determination of the opsonic index, make it generally impractical of application to the treatment of disease in a large number of patients. Besides, as Elsassar remarks in regard to the agglutination method, the patients object to periodical phlebotomies; the reactions are quite enough for them.

The immediate results of tuberculin treatment are not very striking, and up to the time of discharge (generally six months), when patients, treated and untreated, who were classified alike on admission, are compared, there is little difference to be noted in their condition, as the majority, especially in the incipient class, whether treated or not, show more or less marked improvement in symptoms and general condition. It is rather when studying the effect of the injections in patients somewhat more advanced in the disease that one notes occasionally unusually rapid and unexpected improvement, and that the preponderance of improvement seems to be in favor of the patients who have taken tuberculin.

The physical signs in tuberculin-treated cases may appear to grow worse, and rales develop where they were not heard at first, while the expectoration increases; but if no strong reactions have occurred this is not marked, and everything in the chest soon returns to its usual condition and the expectoration lessens if the doses are not pushed too rapidly. Even the disappearance of bacilli is often not much more marked in the treated than in the untreated incipient cases up to the time of discharge, but in advanced cases the comparison with similar untreated cases is in favor of the treated.

I nevertheless have formed the impression that the use of tuberculin brings about somewhat better results than can be obtained by sanitarium methods alone, even up to the time of discharge. The statistical evidence I have been able to gather, and which seems to confirm these impressions, was made for the Sanitarium records at my request by Mr. E. S. Pope, an expert mathematician, to whom

my acknowledgments are due; and I present the evidence of his exhaustive study in as condensed form as possible.

The influence of tuberculin injections on the disappearance of bacilli from the expectoration, when the entire number of treated and untreated patients at the Sanitarium is considered, is as follows:

Of those who had bacilli in the incipient class, 64 per cent. of the untreated and 67 per cent. of the treated lost them; of those classified as advanced on admission, 44 per cent. of the treated lost them, and 24 per cent. of the untreated.

In regard to the results at discharge, Mr. Pope writes: In some years there have been few, and in other years many tuberculin cases. The standards of classification have varied from time to time. Now if there were a large number of treated cases in a year of low standard, the tendency would be to make the total results for tuberculin unduly good. If these conditions were reversed, the opposite result would be obtained. By reducing (or increasing) the numbers of treated and untreated cases to one hundred in each class, in each year, this difficulty is avoided. The correct way to do this is not to select the cases, but to multiply or divide the actual numbers in each class for each year so as to make them equal to one hundred. This applies to the following table:

Comparison of 185 Patients Treated and 864 Untreated. There have been excluded all who stayed less than ninety days, and all who did not have tubercle bacilli on admission.

For the reasons given above, the following percentages have been calculated on the basis of an equal number of treated and untreated patients in each year.

The results at the time of discharge were as follows:

Incipient.			Advanced.		
Apparently cured.	Disease arrested.	Active.	Apparently cured.	Disease arrested.	Active.
Treated . . . 56 p. c.	34 p. c.	10 p. c.	27 p. c.	55 p. c.	18 p. c.
Untreated . . . 50 p. c.	38 p. c.	11 p. c.	6 p. c.	51 p. c.	43 p. c.

In considering these figures we are at once struck with the fact that the advanced cases, both so far as the loss of bacilli and the condition at discharge are concerned, seem to derive proportionately much more benefit from the treatment than the incipient cases. I will refer to this later. You all know how unsatisfactory and unconvincing conclusions based solely on statistics relating to sputum examinations and classification of results can be. The uncertainties of sputum examinations, unless several examinations extending over considerable time are made, and the personal equation of the physician cannot be excluded as influencing the classification of a patient at discharge, and are among the most obvious and misleading sources of error in such statistics.

The study of the post-discharge mortality, however, would seem to promise much more satisfactory and conclusive evidence. Through carelessness we may all fail to find bacilli though they be present; and we may all differ as to whether a patient at discharge is "apparently cured" or the disease "arrested;" but there can be no doubt as to whether the patient be living or dead. Besides, the object of sanitarium treatment is not the condition of the patient at discharge but the prolongation of his life, and time must ever be the crucial test of any treatment. Mr. Pope has condensed for me his canvass of the post-discharge mortality, which bears on 135 treated and 690 untreated patients discharged in the past fifteen years from the institution.

Comparison of 135 Patients Treated and 690 Untreated. Equal numbers of treated and untreated patients in each year are considered; all patients who stayed less than three months, all who left the Sanitarium less than one year ago, and all untraced patients have been excluded.

	Incipient.		Advanced.	
	Living.	Dead.	Living.	Dead.
Tuberculin treated	79 p. c.	21 p. c.	61 p. c.	39 p. c.
Untreated	63 p. c.	37 p. c.	36 p. c.	64 p. c.

From these figures we gather that 18 per cent. more of treated incipient cases are living than of untreated, while 25 per cent. more of advanced cases who received tuberculin are living than of those who did not. The value of such comparative statistics, however, depends entirely on two things: the accuracy of the figures, and the explanation of the results they represent. As to the accuracy of the figures I have little or no doubt, but I regret that I am by no means so certain of their exact value as demonstrating the curative influence of tuberculin. The question is, Are the favorable results which these figures seem to indicate due solely to tuberculin treatment or to other factors?

The only sources of error with which I am acquainted are the influence of the selection of cases, and the fact that the treated remained often much longer in the institution, in order to complete their treatment, than the untreated.

It is impossible to estimate how much the selection of cases has influenced the results, and the more favorable comparative results obtained in the advanced class may be interpreted in two ways, and does not help us much in reaching a correct conclusion. Any specific curative influence of tuberculin would be shown more markedly by prolongation of life in the advanced class, in which the disease was tending toward a fatal termination, than in the incipient class, in which the disease in the majority of cases inclined to arrest and cure without the aid of any specific treatment. On the other hand, selection of cases would have more influence on the results in the

advanced than in the incipient class, because the advanced class is much more comprehensive than the incipient, and there is often as much difference between favorable advanced and unfavorable advanced cases as between incipient and advanced.

Having stated the facts, I must, therefore, leave the interpretation of the figures to the individual judgment of those who may be interested in them. Many years ago, in spite of the general denunciation of tuberculin, and long before I knew anything about the statistical evidence, I had formed the opinion that tuberculin, when carefully administered, had within certain limits a favorable influence on the course of the disease, and that the results of sanitarium treatment could be improved and made more permanent in many cases by its application. As years have passed I have seen no reason to change this opinion, which the figures I have just quoted, however they may be interpreted, do not at any rate tend to contradict.

REVIEW OF THE WORK UPON THE OPSONIC INDEX (WRIGHT AND DOUGLAS) IN TUBERCULOSIS.¹

BY NATHANIEL BOWDITCH POTTER, M.D.,

NORMAN E. DITMAN, M.D.,

AND

ERNEST B. BRADLEY, M.D.,

OF NEW YORK.

HISTORICAL. Ehrlich's theory of immunity developed the conception that before a bacterial intoxication can take place a definite chemical union must exist between the cells of the affected individual and the toxins of the invading microbe. Wright named the various toxins "tropins," because they are substances which turn toward a cell. He calls the toxin of tetanus a "neurotropin," because it combines with the nerve cells. Such a union between tropins and cells calls forth a reaction upon the part of the infected individual to produce so-called "antitropins," which are protective substances. Many kinds of antitropins exist—antitoxins, agglutinins, precipitins, lysins, opsonins, etc. Wright believes that a sufficient amount of such substances within the body is responsible for the existence of natural immunity, and that their elaboration is capable of conferring an artificial immunity. The art of

¹ Read in part by one of us at the meeting of the National Association for the Study and Prevention of Tuberculosis, Washington, D. C., June 17 and 18, 1906.

immunization consists in developing in the animal in question the best conditions for a maximal antitropin formation.

Metchnikoff's patient investigations into the secrets of immunity are based upon his fundamental conception that the existence or cultivation of immunity depends upon the digestive action of certain cells of the body—"phagocytes." Ehrlich's hypothesis and recent contributions to the study of immunity, however, have compelled Metchnikoff to include under the term "phagocyte" a number of cells of different origin. Although he has been obliged to acknowledge the existence of antitropins in the fluids of the body, he has persisted so valiantly with his original conception that he now holds that these bodies are derived from some chemical process, a sort of fermentation going on inside the phagocytes.

At the other extreme the advocates of the humoral theory believe that phagocytosis is a secondary process, a sort of scavenging, which may occur after the germs have been injured or in some way affected by elements existing in the humors.

Denys¹ and Leclef were the first (1895) to produce reliable experimental evidence to prove that there exists in the blood serum of vaccinated rabbits substances which alter microbes in such a way as to permit their digestion by the leukocytes. From careful experiments *in vitro* they concluded that in a vaccinated rabbit the leukocytes obtain their power of engulfing the streptococcus from some property of the serum. The vaccinated animal fights the streptococcus, first by the direct action of its serum; secondly, by its leukocytes. The latter always owe to the serum the commencement of their power. Bordot² was unable to confirm these results.

Mennes³ showed (1897) that the immunity of guinea-pigs vaccinated with toxins or cultures of pneumococci depends upon a modification of their serum whereby an active phagocytosis is produced, and that the leukocytes themselves possess no specific peculiarity. Leishman⁴ devised (1902) a method of estimating quantitatively the phagocytic power of different sera to staphylococci as a measure of the resistance of such sera to infection.

Wright⁵ (1902) showed that the inoculation of sterilized cultures of staphylococci in small doses raised the agglutinating power of the blood to staphylococci. A year later⁶ he estimated the phagocytic index of the blood by Leishman's method, and showed that the patient's phagocytic index is raised to all staphylococci, but more decidedly to his own than to the staphylococci from some other patient.

The first mention of the word "opsonin" occurs in a communication by Wright and Douglas entitled, "The Role of Blood Fluids

¹ La Cellule, 1895, xi, p. 178.

² Zeit. f. Hyg., 1897, xxv, p. 413.

³ Lancet, March 29, 1902.

⁴ Ann. Pasteur, 1897, p. 201, note.

⁵ Brit. Med. Journ., 1902, i, p. 73.

⁶ Proc. Roy. Soc., 1903, lxxii.

in Connection with Phagocytosis."¹ They selected this word (from the Latin verb *opsono*, I prepare the food for) to characterize the substance which they believe prepares the microbes for ingestion by the phagocytes. They showed that the plasma and the serum exerted the same action upon phagocytosis, in other words, the plasma and the serum contain the same amount of opsonin. They showed that the opsonin is thermolabile, being destroyed by heating to 60°C.; that no inhibiting substances can be developed in serum by heating, because 0.85 per cent. salt solution produced no more phagocytosis than the heated serum; and that the activity of phagocytosis decreases at the same rate when unheated serum is diluted with sodium chloride as when diluted with heated serum. They proved that the serum acts upon the microbes and not upon the white corpuscles, and that the cardinal factor in phagocytosis exists in the serum.

Neufeld and Rimpan² (1904), without referring to Wright's work, alluded to the two well-proved antitropic elements in immune sera (that is, antitoxins and bactericidal substances), and stated that they had found a third property of immune serum, which they claimed sensitized the bacteria but did not act upon the leukocytes. They digested leukocytes in antistreptococcic serum, suspended them in normal serum, and found that they did not ingest virulent streptococci. (Note that they employed virulent organisms.) On the other hand, after treating virulent streptococci with antistreptococcic serum and then washing them free from the serum with salt solution, they found that leukocytes could then actively ingest these sensitized microbes. They obtained corresponding results with pneumococci. They proposed to call their sensitizing substances "bacteriotropic" substances. Since other distinct substances have been included under this term it seems more fitting to agree upon the very appropriate name "immune opsonins," suggested by Wright and Douglas.

INDIVIDUALITY OF OPSONINS. Sautchenko³ and Dean⁴ consider that immune serum derives its so-called opsonic action from the presence of amboceptors, because immune opsonins are relatively thermostable. Hektoen,⁵ on the contrary, regards opsonins as distinct from amboceptors, and in proof of his opinion, states that normal serum under certain circumstances may possess lytic but not opsonic power, and vice versa, that immunization may give rise to opsonic but not to lytic substances, and that heat may destroy the opsonic power without affecting the lytic amboceptors, and vice versa.

¹ Proc. Roy. Soc., September 1, 1903, lxxii. p. 357; lxxiii. p. 130.

² Deut. med. Woch., September 29, 1904, xxx. p. 1458; Zeit. f. Hyg. u. Infect., 1905, li. p. 283.

³ Ann. de l'Inst. Pasteur, 1902, xvi. p. 107.

⁴ Proc. Roy. Soc., 1905, lxxvi. p. 506.

⁵ Journ. Amer. Med. Assoc., May 12, 1906, p. 1411.

The opsonin for anthrax bacilli, present in the serum of normal dogs, is destroyed by heating at 60°C . for thirty minutes. The amoceptor for anthrax bacilli, present in the serum of normal dogs, is not affected by heating at 65°C . for thirty minutes. The serum of white rats is normally anthracidal, due to the presence of a thermostable substance that is neutralized by neutralization of the serum with oxalic acid. The same serum contains a thermostable opsonin for anthrax bacilli which, however, is not neutralized by oxalic acid.

RELATION OF OPSONINS TO ANTITOXINS AND BACTERIOLYSINS. We have just mentioned Neufeld and Rimpau's investigations upon antistaphylococcic and antipneumococcic sera in proof of the difference between opsonins and antitoxins and bacteriolysins. Walker's¹ experiments with diphtheria bacilli and tubercle bacilli showed that toxins as well as opsonins produce an effect upon phagocytosis, but that they act independently of one another. Opsonins may be considered analogous to toxins and complements, because they also have two distinct groups—haptophore and opsoniphore. Like complements opsonins may be neutralized or bound by various salt solutions: Ca , Ba , MgCl_2 , K_2SO_4 , NaHCO_3 , etc., and thus prevented from acting upon bacteria.

RELATION OF OPSONINS TO STIMULINS. In his treatise on Immunity, Metchnikoff described a series of experiments conducted by himself, Gengou, Klemperer, Besredka, and others, in which the introduction of serum, sometimes normal, sometimes immune, into the serum sacs of experimental animals demonstrated a greatly enhanced phagocytic activity in the leukocytes of the exudation subsequently removed from the sac for examination. To the substance which these observers conceived to be present in such sera they gave the name "stimulins," and to the presence of these stimulins in immune sera, Metchnikoff and his school attributed an important role in the processes of active and of passive immunization.

Wright and Douglas² endeavored to determine whether unheated serum contains "stimulins" in addition to opsonins. They found the same difference between the action of heated and of unheated serum toward staphylococci heated to 115°C . as toward living germs. Their expectations were based upon the fact that typhoid bacilli heated above 70°C . acquire a resistance to bacteriolytic effect. Although their experiments with particles of India ink and carmine were unsatisfactory, unheated serum seemed to facilitate phagocytosis of these dyes slightly more effectually than heated serum. Staphylococci + unheated serum were digested in an incubator for varying times and then divided into two portions. The first was immediately mixed with corpuscles; the second

¹ Journ. Med. Research, November, 1905, p. 173.

² Proc. Roy. Soc., lxxii. p. 357.

was first heated to 60° C. and then mixed. In every case the phagocytic power was greater when the heating was omitted, and no difference could be detected in specimens left in the incubator fifteen minutes from those left one hour; thus they were obliged to leave the question unsolved.

Leishman¹ in 1905 showed that sera derived from cases of Malta fever or enteric fever, or from animals immunized with living cultures of the germs of these diseases, contain substances which, when added to normal human blood, are capable of increasing the phagocytic activity of the leukocytes of that blood. He also showed that these substances are specific and thermostable, withstanding a temperature of 60° C. for fifteen minutes. No evidence of the presence of these substances could be found in the sera of normal men or animals. He also showed that these substances are not identical with agglutinins, and that they act directly upon the leukocytes and not upon the bacilli. Metchnikoff suggested the name "opsonic sensitizers" for these substances. Wright suggested that they might be thermostable opsonins, in spite of the fact that opsonins act only upon the bacteria, while these substances, if the work and statement of Leishman are to be accepted as correct, act upon the leukocytes.

SPECIFICITY OF OPSONINS. The matter of specificity of bacterial opsonins has not yet been clearly determined, but in the case of a great many infective agents it seems to have been reasonably well established. Wright's² experiments showed that there was a decrease in the staphylococcic-opsonic index of serum to which typhoid bacilli had been added—which would suggest that different bacterial opsonins possess part of their power in common. Some few of our³ sera show a variation in the opsonic index to the different organisms which we employed, notably those from a case of abscess of the liver and a case of pneumonia.

Pearce and Winne⁴ showed that hæmagglutinins exist in cultures of typhoid bacilli, and Hektoen⁵ believes that hæmopsonins may also be developed by bacteria. The specificity of hæmopsonins may also depend upon the types of leukocytes used; as a rule, strict specificity is usually more marked with the use of guinea-pig leukocytes than of dog leukocytes. However, immune sera, as a general rule, appear to have the most marked and earliest hæmopsonic effect upon the corpuscles used for immunization.

¹ Trans. Path. Soc., 1905, lvi, p. 341.

² Proc. Roy. Soc., lxxii, p. 357.

³ These observations have been made in the Pathological Laboratory at the College of Physicians and Surgeons (Columbia University). We wish here to express our thanks to Professors Prudden and Hiss for their kindness in allowing us this privilege.

⁴ AMER. JOURN. MED. SCI., 1901, vol. cxviii, p. 668.

⁵ Journ. Amer. Med. Assoc., May 12, 1906.

DURATION OF OPSONIC POWER. The opsonic power of serum kept at 2° C. is practically unchanged in ten days, but is destroyed in three days if the serum is kept at 37° C.¹

DECREASE OF OPSONIC POWER. Without referring to the temperature Wright and Douglas say: "Opsonic power of blood disappears gradually on standing. In five or six days it is only about one-half as much as the original." Exposure to bright sunlight for three hours reduces opsonic value about one-third.²

Heat. Opsonic power is but little impaired by heat except 50° C. and above.³ Normal human serum contains an opsonin for typhoid bacilli that resists heating above 60° C., and there is an opsonin for anthrax bacilli in serum of white rats that resists heating to 70° C.

Dean⁴ believes that some of the opsonin is unaltered even by heating to 60° C., because upon exposing bacteria to heated serum over a much longer period (Wright and Douglas originally employed fifteen minutes) some phagocytosis occurred.

Immune opsonins are more resistant to heat than the normal.

Leishman⁵ and his co-workers showed that the serum of persons vaccinated against typhoid fever contains sufficient opsonin to promote some degree of phagocytosis after heating to 56° C. Hektoen⁶ mentions that he has several times noted a typho-opsonin in the serum of convalescents from typhoid fever which resists heating to 70° C. for thirty minutes. Immune hemopsonins are also thermostable.

Dilution. The opsonic index of serum varies inversely as the dilution. Simon⁷ has utilized this principle for determining the opsonic index.

Chemicals. Hektoen and Ruediger⁸ showed that the opsonic action of serum may be diminished or inhibited by solutions (isotonic with serum) of CaCl_2 , BaCl_2 , SrCl_2 , MgCl_2 , K_2SO_4 , NaHCO_3 , $\text{Na}_3\text{H}_2\text{C}_6\text{O}_7$, $\text{Na}_2\text{C}_2\text{O}_4$, $\text{KFe}(\text{CN})_6$, formalin, lactic acid, and chloroform. They suggest that certain so-called negatively chemotactic substances, of which lactic acid is a good example, owe their effect to neutralization or destruction of the opsonin. The diminution of resistance to various infections produced by lactic acid, and ascribed to its direct repulsion of phagocytes, is, therefore, perhaps dependent primarily upon the antiopsonic action of the acid.

¹ Jessie Horton. Duration of the Phagocytic Power of Human Leukocytes and of Opsonic Power of Human Serum Outside the Body. Trans. of the Chicago Path. Soc., April, 1905, vi.

² Bullock and Atkin, Proc. Roy. Soc., lxxiv, 1905.

³ Wright and Douglas, loc. cit.

⁴ Proc. Roy. Soc., G. B., 1905, vol. lxxvi, p. 506.

⁵ Journ. of Hygiene, 1905, vol. v, p. 380.

⁶ Loc. cit., page 1411.

⁷ Johns Hopkins Hosp. Reports, January, 1906, 1.

⁸ Journ. of Infec. Dis., 1905, vol. ii, p. 128.

Daboia Venom. The opsonic index is diminished upon digestion of serum with daboia venom.¹

Typhoid. We have already noted that the opsonic index is diminished upon digestion with typhoid bacilli,² and that if other bacteria exist in serum in sufficient numbers and for a sufficient time the opsonin may be completely absorbed.

NON-BACTERIAL OPSONINS. Opsonins for cells other than bacteria have been described. Hektoen³ found opsonins for blastomycetes and probably trypanosomes. Barrat⁴ and Hektoen have observed the presence of haemopsonins in the sera of normal animals. We, working with human sera, have observed it twice in the serum of colored people with tuberculous lesions.

RELATION OF OPSONINS TO LEUKOCYTOSIS. Huggard and Morland,⁵ in their research on the therapeutic effect of the administration of yeast in tuberculosis, found that after a preliminary rise, the number of leukocytes remained constantly below normal. As the opsonic index in these cases was at first low and later high, it was apparent that there was no direct relationship here between leukocytosis and opsonic index. The opposite effect was found by Bullock and Ledingham.⁶ They employed talliamine and sodium cinnamyllicum, both of which increased the number of leukocytes without increasing the opsonic index—thereby sustaining this view.

SOURCE OF OPSONINS. The lack of any relation between opsonins and leukocytosis might be regarded as some evidence against Metchnikoff's belief that the leukocytes themselves furnish opsonin to the serum.

Denys and Leclef, Wright and Douglas, and Neufeld and Rimpau⁷ all showed that the opsonin exists in blood serum—not in leukocytes; but none of them attempts to explain its source.

EFFECT OF DRUGS UPON OPSONINS. *Potassium Iodide.* The administration of potassium iodide has no influence upon the opsonic index. The iodide eruption is not associated with a low opsonic index. The addition of small amounts of potassium iodide to serum does not interfere with its opsonic power.⁸

Owing to the fact that nuclein has a bactericidal action and may cause leukocytosis when introduced into the blood stream, the idea occurred to Huggard and Morland,⁹ in 1905, to determine whether these manifestations were also accompanied by any

¹ Wright and Douglas, Proc. Roy. Soc. lxxii. p. 357.

² Bullock and Atkins, *ibid.*, lxxiv. p. 379.

³ *Loc. cit.*

⁴ Proc. Roy. Soc., 1905, lxxvi. p. 521.

⁵ Lancet, 1905, p. 1193.

⁶ *Ibid.*, vol. II. p. 1603.

⁷ *Loc. cit.*

⁸ British Journal of Dermatology, August, 1905.

⁹ *Loc. cit.*

change in the opsonic index after the employment of nuclein or yeast.

After a single dose of 3 grams of yeast the opsonic index dropped for two days and then rose somewhat above the normal. As has been noted, this rise in opsonic index occurred at the time when the leukocytosis was diminishing and below normal.

Huggard and Morland have made the observation that some of the lowest opsonic indices in cases of tuberculosis under their observation occurred in heavy smokers.

RELATION OF VIRULENCE OF BACILLI TO THE TUBERCULO-OPSONIN. Denys and Leclef, Hektoen and Ruediger, and Hektoen and Horton¹ have confirmed Metchnikoff's fundamental conception that the increase of virulence of a certain organism goes hand-in-hand with its resistance to phagocytosis. They worked with streptococci, staphylococci, pneumococci, and anthrax bacilli.

Hektoen² concludes that the organism defends itself in one or both of two ways, that is, by producing substances which are harmful to the phagocytes, and by an increased resistance to opsonification. No observations as yet have been recorded as to the variability of the tuberculo-opsonin with tubercle bacilli of different virulence.³

The tuberculo-opsonic index in healthy individuals has been estimated by Bullock⁴ in a series of thirty-four medical students and thirty-two nurses. The average of the sixty-six subjects was 0.95, with a maximum of 1.20 and a minimum of 0.80. Urwick⁵ in twenty individuals obtained an average of 1.006.

We have made eighty-one observations⁶ upon nineteen supposedly normal persons and obtained an average opsonic index of 0.988, with a maximum of 1.25 and a minimum of 0.73. We have not attempted to make a pool of a number of supposedly normal cases, as has been suggested by Wright,⁷ because we have found that the normals vary to some extent, and so we have estimated three or four different normal sera separately in indexing each series of our cases. Then unless there was a considerable variation in the different normals we have struck an average with which to compare the sera to be studied. Urwick also proved that the tuberculo-opsonic index in healthy people does not vary from day to day.

Our series of nineteen normal persons estimated during the

¹ Loc. cit., p. 1413.

² Loc. cit., p. 1414 and 1415.

³ Our figures have been estimated from cultures of varying virulence obtained through the kindness of Drs. Ewing, Theobald Smith, and Baldwin. We have as yet made no comparative estimates.

⁴ Trans. Path. Soc., 1905, vol. lvi. p. 334.

⁵ Brit. Med. Journ., July 22, 1905.

⁶ For the material we wish to express our thanks to the Staffs at the New York, Roosevelt, City, French, Ruptured and Crippled, and Hudson Street Hospitals, and to Dr. Linsly R. Williams, of the Vanderbilt Clinic.

⁷ Proc. Roy. Soc., G. B., 1906, vol. lxxvii. p. 194.

past three months shows the following variations in four persons: 0.84 to 1.18, 0.81 to 1.10, 0.88 to 1.10, and 0.92 to 1.06.

The tuberculo-opsonic index in different varieties of tuberculosis has been studied by a number of observers. Bullock examined 150 cases of lupus from the mildest type to the most chronic and intractable and obtained an average index of 0.75, with a minimum of 0.2 to 0.3 (three cases) and a maximum of 1.0 to 1.4 (fourteen cases). Urwick examined fifty-four cases of tuberculosis, including a number of cases of tuberculosis of the lungs in various stages.

In many of them, especially of tuberculosis of the lungs, the index was above normal, with variations from 0.3 to 2.6. In thirty-three cases of pulmonary tuberculosis, twenty-five showed an index above 1, seven below 1, and one was at 1. Wright and Douglas¹ examined sixteen cases of tuberculosis, including tuberculosis of the skin and subcutaneous tissues, tuberculous laryngitis, cystitis, peritonitis, prostatitis, and tuberculous glands. The indices ranged from 0.4 to 0.9.

We have made observations on thirty-nine cases of tuberculosis as follows: Tuberculosis of the bones, including spine, hip, knee, ankle, tarsus, and tibia—in all twenty-two—above 1 in five cases, below 1 in fourteen cases, and normal in three. In fourteen cases of pulmonary phthisis the figures vary from 0.41 to 1.37: above 1 in one case, below in eleven, and normal in two; and isolated cases of lupus and tuberculous glands, ranging from 0.96 to 1.51.

We have also estimated the tuberculo-opsonic index in a series of forty patients with varied diseases. The index was between 0.70 and 1.15 in thirty-five of these; of the remaining five there were below 0.70 four cases (two typhoids, osteomyelitis of tibia, carcinoma of stomach); above 1.15 one case, paralysis agitans with cystitis (1.38).

We have compared the tuberculo-opsonic index with the staphylococcic-opsonic, streptococcic-opsonic, pneumococcic-opsonic, gonococcic-opsonic, or colon-opsonic indices in sixteen normal subjects, in fourteen cases of tuberculosis, and in twenty-three cases of varied diseases. No marked variations occurred in the normal cases. In the tuberculous cases variations between the tuberculo-opsonic index and the staphylococcic-opsonic index ran from 2 per cent. to 50 per cent. Of the remaining twenty-three variations occurred in some cases, notably, an obscure hepatic case (cholelithiasis?): Tb. 0.96, staph. 0.85, colon 0.46; abscess of the liver: tb. 1.06, staph. 0.93, pneum. 0.72, colon 1.50; abscess of the liver: tb. 1.10, staph. 0.61, colon 0.17; chronic gonorrhœal arthritis: tb. 0.67, gon. 1.10; cirrhosis of the liver: tb. 1.13, staph. 0.45.

METHODS OF DETERMINING THE TUBERCULO-OPSONIC INDEX.

Leishman was the pioneer to devise an ingenious quantitative method

¹ Proc. Roy. Soc., 1904, vol. lxxiv.

of estimating phagocytosis. Wright's¹ modification of this method is as follows: equal volumes of (1) a bacillary emulsion in salt solution, (2) the serum to be tested, and (3) washed blood corpuscles, are measured in a capillary pipette fitted with a rubber teat, mixed thoroughly by blowing out on a slide several times, drawn up in the same pipette, the end sealed in the flame, and then incubated for fifteen or twenty minutes at 37° C. A drop of this mixture is blown out on a slide, and a smear made, fixed, and stained. The enumeration of the bacilli in twenty to fifty polymorphonuclear neutrophils is made under a one-twelfth inch oil immersion lens, and an average per leukocyte obtained. This average divided by that for a normal serum constitutes the opsonic index.

The procedure² for making the suspension of tubercle bacilli is as follows: The conglomerated mass of bacilli is heated at 100° C. for ten minutes and a loopful is ground up in an agate mortar; from time to time a drop of salt solution is added until about 2 c.c. are added; it is then centrifugated in a small tube at high speed for from five to eight minutes, until the supernatant fluid is only slightly opalescent—the bacterial suspension employed.

The washed corpuscles are obtained by receiving 20 to 40 drops of blood into about 30 c.c. of 1 per cent. sodium citrate in 0.85 per cent. sodium chloride solution. After centrifugating, the supernatant fluid is pipetted off and 0.85 per cent. NaCl is substituted. They are washed thus twice and finally the salt solution is pipetted off and the upper layer of the corpuscles which is rich in leukocytes is taken for the washed corpuscles. This should be quite thick in order to make good smears and to prevent the leukocytes from breaking up.

The serum is obtained by receiving the blood to be tested in small glass capsules with curved capillary limb, allowing it to clot, and then centrifugating so that the clear serum is easily accessible.

Our slides for tubercle bacilli have been fixed in formalin vapor, stained in aniline fuchsin, decolorized in acid alcohol, washed in 1 to 1000 sodium carbonate solution, and counterstained with methylene blue.

Difficulties. Of course, in a method of this kind there are many difficulties and sources of error, and an enumeration of some of those which we have met may prove helpful to others. The most difficult thing of all is to get a bacillary emulsion free from clumps and of the right strength. If too thick, the bacilli cannot be counted accurately; and if too thin, there will not be enough to strike a proper average. Counts averaging from two to five

¹ Proc. Roy. Soc., 1903, vol. lxxii. and 1904, lxxiii.

² We have followed the details of this technique—essentially those of Wright—to whom we wish to express our hearty thanks for his kindness in personally explaining his methods to one of us.

bacilli per leukocyte are to be desired. The varying opalescence of a series of tubes of barium sulphate suspension of different strengths will serve as a comparison of the thickness of the bacterial emulsion.¹ With tubercle bacilli an added difficulty is that after the bacilli are separated they are clumped by salt solutions of any concentration greater than 0.1 per cent., and unheated bacilli are agglutinated by any blood serum. To prevent this clumping, the bacilli are heated at 100° C. for ten to fifteen minutes, and the suspension is made in 0.1 per cent. salt solution.

For the sake of accuracy the capillary pipettes should be of approximately the same calibre. The "leukocytic cream" should be used fresh, otherwise the leukocytes tend to stick together.

Smears are best made by using a slide with the corner broken off and the end made rough with a file. The smears should be fairly thick and are made best by pushing the smearer. The edges of the smears are counted because most of the leukocytes collect there. It is better to select isolated leukocytes for counting or at most bunches of only two or three, as the counts for these are more uniform than when large masses of leukocytes are counted. Cleanliness, speed, and accuracy are essential to good technique.

DIAGNOSTIC VALUE OF THE TUBERCULO-OPSONIC INDEX. The diagnostic value of the tuberculo-opsonic index is a subject which is just beginning to be worked upon.

Wright and Reid² have furnished the only contribution. Their conclusions are:

1. Where a series of measurements of the opsonic index of the blood is persistently low, it may be inferred in the case where there is evidence of a localized bacterial infection which suggests tuberculosis that the infection is tuberculous in character.

2. Where repeated examination reveals a persistently normal tuberculo-opsonic index, the diagnosis of tuberculosis may with probability be excluded.

3. Where there is revealed by a series of blood examinations a constantly fluctuating opsonic index, the presence of active tuberculosis may be inferred.

4. When there is only a single blood examination—if this is low, tuberculosis, either localized or systemic, may be inferred. If the tuberculo-opsonic index is high, systemic tuberculous infection which is active or has recently been active may be inferred. If the tuberculo-opsonic index is normal or nearly normal, neither a negative nor positive conclusion is warranted. Our observations tend to confirm this statement.

5. Since there are developed in blood serum in those undergoing

¹ Suggested by McFarland. *Medicine*, April, 1906

² *Proc. Roy. Soc.*, 1906, vol. lxxvii.

inoculation with tubercle vaccine, or, as the case may be, in those who have responded to tuberculous infection, certain opsonic-like substances which resist heating to 60° C. for ten minutes, tuberculosis in those whose serum retains in any considerable degree the power of inciting phagocytosis after it has been so heated may be inferred.

Whether this point can be of much diagnostic value would seem rather doubtful from our observations. In a series of sixteen sera derived from different varieties of tuberculosis, we found the tuberculo-opsonic index of the unheated sera varied from 0.41 to 1.20; that of sera heated at 60° C. for ten minutes varied between 0.00 and 0.20. In five normal control sera the index of the unheated sera varied from 1.0 to 1.08; that of the heated sera from 0.02 to 0.60.

In another series we found that heating at 50° C. for ten minutes only slightly diminished the index of the heated as compared with the unheated serum. There was no difference between the normal and the tuberculous individuals. In both the above series we employed an emulsion of bacilli in 1.6 per cent. salt solution.

In a further small series we heated at 60° C. for ten minutes, employing an emulsion of bacilli in 0.1 per cent. salt solution. The figures obtained were as follows:

	Unheated.	Heated.
Tuberculous ankle, ante-operation	0.89	0.45
Tuberculous ankle, post-operation	1.26	1.60
Normal	1.00	0.23
Normal	1.17	0.24
Pneumonia, tuberculous	0.84	0.30
Pneumonia, tuberculous	0.86	0.20
Normal	1.02	0.14
Normal	0.73	0.14

Attention has been called to the supposition that the bacilli grow in regions of low bacterio-tropic pressure, and observations tend to show that fluids or pus from such regions contain a much smaller amount of opsonin than the blood serum obtained in the usual way from the finger. Hence, when the tuberculo-opsonic index of such fluids is much lower than that of the blood serum the presence of a tuberculous infection may be inferred.

Thus far we have estimated the opsonic index in four such cases, as follows:

CASE I.—Herpes zoster with hydrothorax: tuberculo-opsonic index of blood serum, 1; tuberculo-opsonic index of chest fluid, 1.

CASE II.—Tuberculous caries of the spine with empyema: tuberculo-opsonic index of blood serum, 0.8; tuberculo-opsonic index of pus from chest, 0.3.

CASE III.—Tuberculous pleurisy with effusion: tuberculo-opsonic index of blood serum, 0.78; tuberculo-opsonic index of chest fluid,

0.89. In this case the pneumococcic opsonic index of blood serum was 1.09; chest fluid, 0.95.

CASE IV.—Empyema following pneumonia: tuberculo-opsonic index of blood serum, 0.84; tuberculo-opsonic index of pus from chest, 0.00°.

THE EFFECT OF TUBERCULIN ON TUBERCULO-OPSONIC INDEX. "A vaccine" is defined by Wright¹ to be "any chemical substance which when introduced into the organism causes there an elaboration of protective substances, or a vaccine is a substance which induces in the organism an elaboration of bacterio-tropic elements. A tubercle vaccine is one which induces an elaboration of tuberculo-tropins."

CHART 1

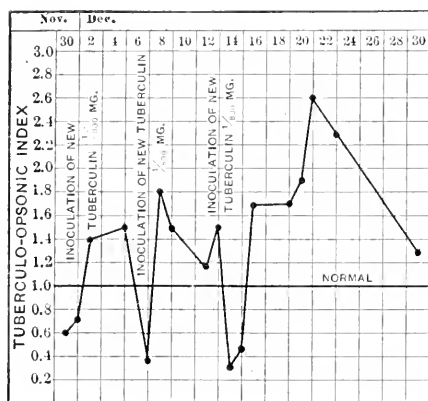
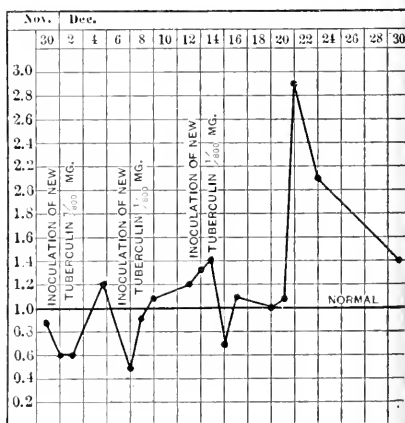


CHART 2



Relating to H. and D., two children with tuberculous glands, who were treated with therapeutic inoculations of T. R. The curves show the condition of the blood before inoculation and the changes in the tuberculo-opsonic power which supervened upon the first three inoculations.—Wright, *Medico-Chirurg. Transactions*, 1905, vol. lxxxix, p. 5.

Tuberculin, or a tubercle vaccine, is always a derivative of the bacterial cell and when inoculated withdraws from the organism a certain amount of protective substances. Deprived of the tuberculo-tropic substance, the cells are stimulated and replace not only that which is withdrawn, but more.

Immediately after the injection of tuberculin there is a period of diminished resistance, shown by diminution of protective elements in the blood, both agglutinins² and opsonins—it would seem the so-called "negative phase;" succeeding this, there is an inflowing of, and consequent increase in, the protective elements—"positive phase." Most of these protective elements rapidly disappear, but leave behind in the blood a more or less permanent

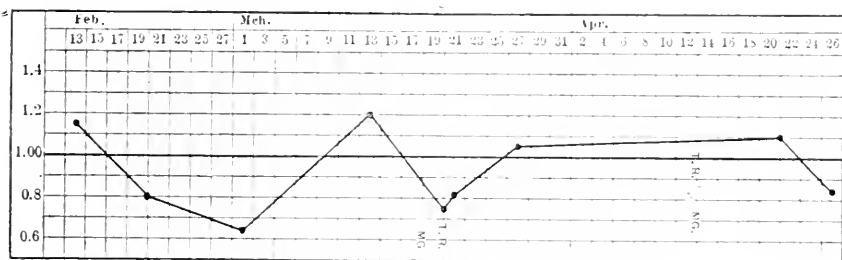
¹ The Clinical Journal, November 9, 1904.

² Wright, *Lancet*, May 9, 1903.

increase over the original. Wright speaks of the whole sequence as the "Law of the ebb and flow, and reflow and maintained high tide of immunity." This is illustrated in the accompanying Charts 1 and 2.

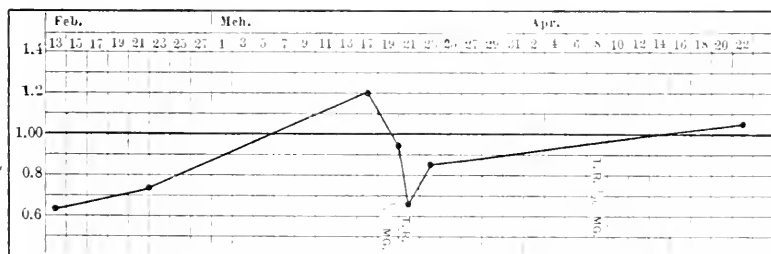
This train of events succeeds inoculation of vaccine sufficient to cause a constitutional disturbance. When only a small dose of vaccine is given, the negative phase may be so insignificant and of such short duration as not to be capable of measurement, and the positive phase will be correspondingly diminished. On the

CHART 3



Patient S. Tuberculosis of the hip, with marked improvement clinically.

CHART 4



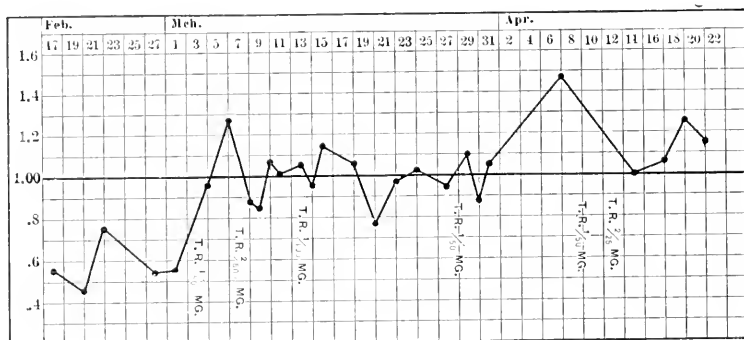
M. S., aged fifty years. Lupus of long standing: slight improvement only.

other hand, if the dose of vaccine is too large, the negative phase will be unduly prolonged and a positive phase may not appear at all. The question of dose, then, is of the greatest importance, for if too little is employed no therapeutic effect will result; while on the other hand, too large a dose is dangerous and so lowers the resistance of the organism as to favor the multiplication of the bacteria. Such dangers with a single inoculation are, of course, greatly magnified by repeated inoculations. If a series of such inoculations is attempted during the negative phase, there will

result a further fall in the protective substances or a "cumulation in the direction of the negative phase."

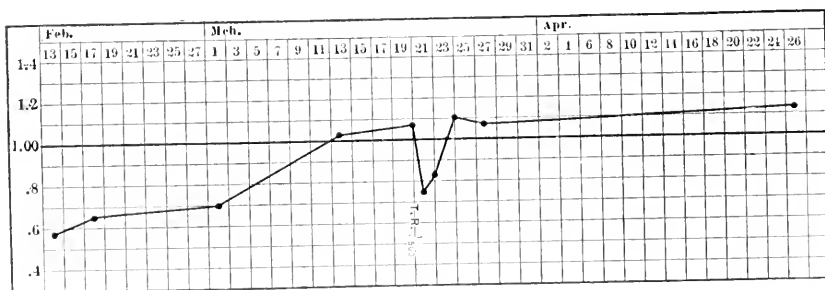
Wright and his associates consider that the result of the vaccination cannot be estimated from the character of the constitutional disturbance, but with some reason urge the daily determination of the opsonic index to measure the effect.

CHART 5



Patient K. G. Tuberculosis of the ankle; no improvement.

CHART 6



Patient S. Tuberculosis of the ankle; slight improvement.

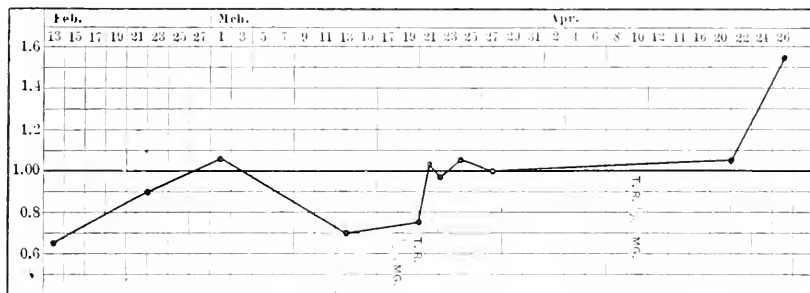
Wright¹ advises the smallest possible initial dose sufficient to produce any negative phase, and re-inoculation only after the subsequent positive phase has begun to diminish.

Sooner or later a point will be reached when the organism ceases to respond to inoculation, and further doses of vaccine not only do no good, but may bring the content of the blood in protective substances to a lower level than that from which it originally started.

¹ Lancet, December 2, 1905, p. 1598.

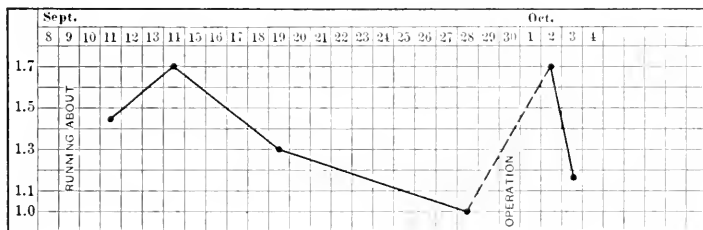
The appended curves of patients with tuberculous disease show the variations in the tuberculo-opsonic index as a result of our tuberculin inoculations.

CHART 7



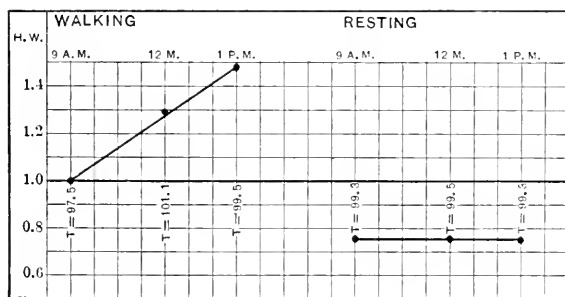
Patient M. S. Tuberculosis of the ankle; slight improvement.

CHART 8



Shows in the case of a child with tuberculous caries of the fibula that the tuberculo-opsonic power may be raised by active exercise and surgical procedures.

CHART 9



Shows in a case of pulmonary tuberculosis undergoing sanitarium treatment how exercise may influence the tuberculo-opsonic index. Dr. J. Freeman, curve used by Wright.—*Medico-Chirurg. Transactions*, 1905, vol. lxxxix. p. 17.

The tubercle vaccine employed was Koch's T. R., tuberculin.¹ 1 c.c. of T. R. equal to 1 milligram of tubercle powder. Wright advises that the initial dose should not exceed $\frac{1}{1000}$ milligram.

The cases treated by T. R. controlled by the estimation of the tuberculo-opsonic index reported thus far, consist entirely of localized tuberculous infections and include, tuberculous peritonitis, cystitis, glands and sinuses following an operation for their removal, tuberculosis of the subcutaneous tissues, lupus, etc.²

The danger underlying the treatment of any active process in the lungs is very great, for such a case is absorbing tuberculin from the site of infection and his life according to Wright consists of a succession of negative and positive phases. So long as we cannot regulate the amount of bacterial substances absorbed, the physician would only be adding to the danger by inoculating the tuberculin. This refers, of course, especially to those cases of tuberculosis running a temperature, which are more or less systemic infections.

Charts 8 and 9 show how exercise and operation may influence the opsonic index by increasing the flow of lymph through tuberculous foci, the result being as if tuberculin had been administered. They serve also to show how dangerous it might be further to inoculate such cases, there being no way, of course, to regulate the dose of tuberculin absorbed by the organism from *his own* focus or foci of infection.

Wright also cites two phthisical patients whose indices had never been lower than 1. They took part in a dance, both became ill; and their indices declined to 0.12 and 0.33 respectively; another phthisical patient whose index fell as a result of overwork to 0.2 from a level of over 1.

We have not attempted to criticise any of the work outlined above, for the evident reason that our subject is merely a review. The delay in mastering the difficulties of the technique, despite the good fortune of one of us in seeing Prof. Wright and his associates at work, and the comparatively few observations we have made, would in any event prohibit a very definite opinion upon our part. Although diagnosis may not be materially aided, and treatment particularly with tuberculin, as suggested by Dr. Kinghorn, may not require such elaborate and repeated blood examinations, it may be that some assistance toward accuracy of prognosis may be forthcoming. Continued observations will decide.

¹ The effect of protective inoculation of tubercle vaccine on rabbits has been studied by E. R. Baldwin (Medical News, September 30, 1905) and his associates at Saranac Lake, New York, with somewhat negative results as to the opsonic content of bloods compared with the agglutinating reaction, and would seem to be rather more complex than Wright believes.

² Wright, loc. cit.

THE TECHNIQUE OF THE TUBERCULO-OPSONIC TEST.¹

BY HUGH M. KINGHORN, M.D.,

AND

DAVID C. TWICHELL, M.D.,

OF SARANAC LAKE, NEW YORK.

(From the Saranac Laboratory, Dr. E. L. Trudeau, Director.)

ACCORDING to Professor A. E. Wright, the phagocytic effect obtained when bacteria are introduced into the blood is dependent upon an action exerted by the blood fluids directly upon the micro-organisms. He speaks of this action, which prepares the micro-organisms for phagocytosis, as an opsonic action (Latin: *opsono*, I cook, I prepare pabulum for). It is due to the presence in the blood fluids of substances he calls opsonins. Opsonins for tuberculosis are substances which modify tubercle bacilli in a manner which renders them an easy prey for the phagocytes.

The following observations have been made by Professor Wright and Captain S. R. Douglas: (1) Opsonins are contained in the blood fluids—serum or plasma; (2) they lose their power when heated to 60 to 65° C. for ten to fifteen minutes; and (3) they exercise their influence by effecting a modification in the bacilli, and not by exerting a direct stimulating effect upon the phagocytes.

The object of this paper is to discuss the technique of the method used in estimating the opsonic power in the blood of tuberculous patients, and also of those undergoing tuberculin treatment, and to record our experience with it. Briefly, the method employed by Professor Wright is as follows:

Equal quantities of the patient's serum, an emulsion of tubercle bacilli, and white blood corpuscles (washed in 0.5 per cent. sodium citrate in normal salt solution) are mixed in a capillary pipette and incubated at 37° C. for twenty minutes, after which blood films are made of the mixture and stained for tubercle bacilli. The average number of tubercle bacilli ingested by each polymorphonuclear white corpuscle is calculated, and the figure thus obtained is called the phagocytic index. The opsonic index is the result obtained by dividing the number of bacteria taken up per leukocyte in the presence of any given serum by the number taken up per leukocyte in the presence of the serum of a normal individual, which latter is regarded as unity. For example, the number of tubercle bacilli per leukocyte in the presence of a given serum = 3.

¹ Read at the meeting of the National Association for the Study and Prevention of Tuberculosis, Washington, D. C., May 17 and 18, 1906.

Tubercle bacilli per leukocyte in the presence of a healthy serum=2
2:3::1: opsonic index = 1.5.

The difficulties which we experienced in the Saranac Laboratory in using this tuberculo-opsonic test of Wright were considerable. We, therefore, purpose to give the various steps in detail, together with modifications which we have tried.

METHOD OF OBTAINING WASHED LEUKOCYTES. It was found by Wright and Douglas that the source of the white corpuscles used made no difference in the result; in fact they can be taken from the patient or from some healthy person. An inferior position is, therefore, assigned to the source of the polynuclear white cells in the work of phagocytosis as compared with the serum.

To obtain the blood we make a prick in the side of a finger with a needle, and wind a piece of string around the finger from above downward in order to render it turgid. As the blood emerges from the prick, we draw it into a pipette containing a small amount of 0.5 per cent. sodium citrate solution in 0.85 per cent. NaCl. A 10 c.c. pipette, with a bulb and a short stem drawn to a fine point, allows thorough mixing of the blood and citrate solution. The citrate solution prevents the blood from clotting. After each large drop of blood is drawn into the pipette, we draw up a little more citrate solution and shake gently. From six to ten large drops of blood are sufficient. This mixture of blood and citrate solution is then centrifugalized in narrow tubes, the supernatant solution drawn off, and then about the same quantity of 0.85 per cent. NaCl solution thoroughly mixed with the blood. This mixture is then centrifugalized, the supernatant solution drawn off, care being taken not to draw too close to the corpuscle sediment lest the layer of white cells be disturbed. This layer of white cells, called "blood cream" by Wright, is then carefully drawn off from the blood and thoroughly mixed. Formerly Professor Wright used four washings, the first with the citrate, and the remaining three with 0.85 NaCl. At present two washings are used, and we find it sufficient.

METHOD OF OBTAINING THE EMULSION OF TUBERCLE BACILLI FOR PHAGOCYTOSIS. Considerable difficulty has been experienced by almost all who have used the tuberculo-opsonic test in obtaining a suitable emulsion of bacilli. This is due to the fact that the bacilli appear so frequently in clumps and not separated homogeneously.

At the very outset a twofold technical difficulty confronted Wright and Douglas in preparing their emulsions. The first difficulty was associated with the fact that the tubercle bacillus occurs in ordinary cultures in agglomerated masses. The second difficulty is due to the fact that unaltered tubercle bacilli, when they have been obtained in homogeneous suspension, are agglu-

minated by the action of both serum and physiological salt solution. They overcame the first difficulty by breaking up the bacterial masses in a mortar in a 0.1 per cent. salt solution, that is, in a salt solution diluted up to the point at which it will no longer bring together by its agglutinating action tubercle bacilli which have been mechanically separated. The second difficulty was overcome by heating the tubercle culture to 100° C.

In a private communication recently received from Dr. George W. Ross, an assistant of Professor Wright, the following directions were given to obtain an emulsion of tubercle bacilli such as they now use:

1. "If you use the glycerin suspension of tubercle bacilli (such as is left after making old tuberculin) you must first wash out the glycerin by means of water and filter paper—ending up the final washing with 1.5 per cent. solution of NaCl.

2. "Next transfer to a small agate mortar (one to one and one-half inch in diameter) and rub up the washed tubercle bacilli to a paste; that is, use only a little of the 1.5 per cent. salt solution to begin with. Keep rubbing up, continually adding more salt solution until you have an emulsion which has the opalescence of thick ground-glass.

3. "Centrifugate for some minutes to drive down the larger clumps.

4. "Pipette off the supernatant emulsion. As a rule this requires further diluting with the 1.5 per cent. salt solution. The extent of this is only learned by putting up trial tubes with serum and corpuscles. For example, if in the trial experiment the leukocytes contain clumps of say four or five bacteria each, you will know that further dilution and centrifugalization are necessary. Use always a 1.5 per cent. salt solution.

"From one to two tubercle bacilli per cell is a convenient average."

In our own work we have, however, used a different emulsion, prepared by Dr. E. R. Baldwin, who tried to improve the method by removing some of the wax from the bacilli, and thus to render them free from clumps. He did this by extraction with chloroform, as follows:

- (a) A quantity of tubercle bacilli from broth cultures was washed until free from all traces of the culture medium. After drying these in the desiccator, 150 grams were pounded and rubbed to a fine powder in a mortar to break up the large clumps.

- (b) This powder was then placed in a flask with chloroform. The flask was heated on a water-bath with a return condenser. The emulsion was then filtered on hard filter paper. The residue was washed with hot chloroform, and afterward evaporated by exposing the filter to air and then in the desiccator. This residue was again rubbed in a mortar, and extracted again in the same manner.

(c) The washed residue was finally suspended in 185 c.c. cold chloroform and used as a stock emulsion.

To obtain a suspension from this stock emulsion our procedure is as follows: 0.3 c.c. of the chloroform emulsion is measured off and put into a small mortar; the chloroform is allowed to evaporate, which it does almost instantly, and the dry white powder that remains is rubbed up with 1 c.c. of 0.1 per cent. NaCl. First it is rubbed in a small quantity of this salt solution, and then the remainder is slowly added. This emulsion is then transferred to a small centrifugating tube and centrifugalized for five minutes, at definite speed, to throw down the coarse clumps. A small quantity of the supernatant fluid is drawn off and thoroughly mixed. If one draws directly from the emulsion which remains in the centrifugating tube, when first the test is made, one may draw from different layers and thus render the test inaccurate. The emulsion thus obtained is of very uniform density and free from clumps. The only objection is that some of the bacilli appear feebly stained. A further objection may be made that alterations are produced in the bacilli by the extraction with chloroform. Comparative tests, however, with simply sterilized bacilli, have shown that the same relation may be expected in the phagocytic activity in each of them. Since the object of the test is to compare the opsonic strength of different serums, the particular form of the emulsion which gives the most accurate results is the only factor of importance.¹

METHOD OF OBTAINING THE SERUMS. When an opsonic test is made we need some standard for comparison. At present the fresh mixed serums of several healthy persons are used as the standard serum by Professor Wright, and this mixed serum is regarded as unity.

The use of this standard is justified by the following facts: (1) The opsonic power is approximately the same in all healthy people, and (2) the opsonic power of healthy people varies very slightly, or not at all, from day to day.

It is found that the opsonic power decreases gradually after the serum has been withdrawn from the body, and it is, therefore, necessary that the standard serum and the serum to be tested should be withdrawn within a few hours of each other. Wright found that the opsonic power of the serum diminished but slightly up to twelve to eighteen hours, but that after that it diminished considerably. In our work thus far we have used but one normal serum for a standard.

METHOD OF MIXING AND INCUBATING THE WASHED LEUKOCYTES, THE SERUM, AND THE EMULSION OF TUBERCLE BACILLI. Having obtained the washed leukocytes, the serum, and the emulsion we then proceed to make the test.

¹ Instead of the chloroform emulsion, we now use an emulsion prepared according to Wright's method, and find it very satisfactory.

We make the pipette, into which they are drawn, in the following way: A piece of glass tubing, about one-quarter inch in diameter and from four to five inches in length, is heated over a flame and drawn out as fine as possible, and divided in the middle. The stem of this is about two inches in length, and the drawn-out part about seven to eight inches. At a point about one to one and one-half inches from the capillary end a mark is made with a blue or red pencil. This serves to measure the serum, emulsion, and corpuscles. By placing a closely fitting rubber nipple over the end of the stem, and by packing the stem for a short distance by two small layers of absorbent cotton, and between these a small layer of some powder, such as plaster-of-Paris or chalk, it is an easy matter to draw up to the index the serum emulsion and corpuscles, and to allow a small space of air between each of these. The tip of the pipette is wiped off after each operation.

The three are then expelled into a small tapering tube about one-eighth inch in diameter, one inch long and closed at one end, and thoroughly mixed by drawing the liquid in and out. The mixture is then again drawn into the pipette, the end sealed in a flame, and placed in the incubator at 37° C. for twenty minutes. On removing the pipette from the incubator the contents are again thoroughly mixed in another small tube, as described above, and slide smears are then made.

METHOD OF PREPARING SLIDES FOR THE RECEPTION OF BLOOD FILMS. Professor Wright's method is as follows: He says that the really important thing in connection with the slide is to be sure that its surface shall be rough. The polishing of the surface and the defective adherence between the blood and the slide which results from it furnish the opportunity for the piling up of the corpuscles one upon another, under the influence of the surface tension of the fluid. The polishing of the slide is, in other words, directly responsible for the patchiness of the ordinary blood film. He therefore finds it of benefit to boil all slides in strong caustic potash until their surface has become definitely hazy. This haziness depends upon inequalities of the surface, and it disappears when the surface oil or Canada balsam is placed upon the slide.

A still better method, also described by Wright, is to rub the surface of the slide with emery paper. He employs the finest variety of emery paper, and in order to obtain the necessary mechanical pressure mounts the emery paper by means of a rubber ring upon a stout cylindrical ruler.

METHOD OF HARDENING AND STAINING THE SLIDES. Professor Wright's present method is to fix the blood films in saturated corrosive sublimate, stain with boiling carbol-fuchsin, decolorize with 2 per cent. sulphuric acid, and counterstain with methylene blue after washing in 1 to 1000 sodium carbonate.

Our method has been to fix with wood alcohol for several minutes,

heat in the incubator at 37° C. for ten minutes in aniline-fuchsin, decolorize with 0.5 per cent. hydrochloric acid in 50 per cent. alcohol, and counterstain with Wright's stain. Wright's blood stain (James H. Wright) for counterstaining has proved superior in our hands to any other. We use it diluted with two parts of wood alcohol. The films are then dried and examined.

NUMBER OF CELLS NECESSARY TO COUNT. In the various published works by Professor Wright and his associates it would appear that the count from a comparatively small number of leukocytes was thought sufficient for the determination of the opsonic index. We have paid special attention to this point in order to satisfy ourselves as to the usefulness of the test so far as tuberculosis is concerned. While it is true that the bacilli counted in 20 to 30 leukocytes may indicate in some cases the correct relation between a normal and a tuberculous serum, when all the conditions are favorable as to sera and technique, we have found that an accurate count requires from 100 to 200 cells. Some examples showing the variations encountered are appended.

Up to the present time our work has been mainly confined to technique, and to testing the blood of patients who are taking tuberculin treatment. Our results are too few to give any definite conclusions, and we intend to give these at a later date.

The following counts of 200 polynuclear cells show the variations in groups of 25, 50, 100, and 200 cells:

EXPERIMENT 30, MARCH 27, 1906.

K.'s washed corpuscles..... 1 vol.

J. P.'s serum..... 1 vol.

Suspension of tubercle bacilli. 1 vol.

(The whole incubated at 37° C. for twenty minutes.)

(t. b. = tubercle bacilli.)

1st	25 polynuclear cells	27 t. b.	= average of 1.08 t. b. per cell
2d	"	" 27 "	" 1.08 " "
3d	"	" 39 "	" 1.56 " "
4th	"	" 31 "	" 1.24 " "
5th	"	" 24 "	" 0.96 " "
6th	"	" 30 "	" 1.20 " "
7th	"	" 24 "	" 0.66 " "
8th	"	" 45 "	" 1.80 " "
1st	50 polynuclear cells	54 t. b.	= average of 1.08 t. b. per cell.
2d	"	" 70 "	" 1.40 " "
3d	"	" 54 "	" 1.08 " "
4th	"	" 69 "	" 1.38 " "
1st	100 polynuclear cells	124 t. b.	= average of 1.24 t. b. per cell
2d	"	" 123 "	" 1.23 " "
1st	200 polynuclear cells	247 t. b.	average of 1.23 t. b. per cell.

EXPERIMENT 30, MARCH 27, 1906.

K.'s washed corpuscles..... 1 vol.

D. C. T.'s serum..... 1 vol.

Suspension of tubercle bacilli 1 vol.

(The whole incubated at 37° C. for twenty minutes.)

1st	25	polynuclear cells	22 t. b.	= average of 0.85 t. b. per cell
2d	"	"	" 27 "	" 1.08 " "
3d	"	"	" 26 "	" 1.04 " "
4th	"	"	" 27 "	" 1.08 " "
5th	"	"	" 21 "	" 0.84 " "
6th	"	"	" 38 "	" 1.52 " "
7th	"	"	" 38 "	" 1.52 " "
8th	"	"	" 33 "	" 1.32 " "
1st	50	polynuclear cells	49 t. b.	= average of 0.98 t. b. per cell
2d	"	"	" 53 "	" 1.06 " "
3d	"	"	" 59 "	" 1.18 " "
4th	"	"	" 71 "	" 1.42 " "
1st	100	polynuclear cells	102 t. b.	average of 1.02 t. b. per cell
2d	"	"	" 130 "	" 1.30 " "
1st	200	polynuclear cells	232 t. b.	average of 1.16 t. b. per cell

EXPERIMENT 32, MARCH 29, 1906.

K.'s white blood corpuscles... 1 vol.

J. P.'s serum..... 1 vol.

Suspension of tubercle bacilli 1 vol.

(The whole incubated at 37° C. for twenty minutes.)

1st	25	polynuclear cells	31 t. b.	average of 1.36 t. b. per cell
2d	"	"	" 31 "	" 1.24 " "
3d	"	"	" 34 "	" 1.36 " "
4th	"	"	" 49 "	" 1.96 " "
5th	"	"	" 39 "	" 1.56 " "
6th	"	"	" 31 "	" 1.24 " "
7th	"	"	" 41 "	" 1.64 " "
8th	"	"	" 22 "	" 0.88 " "
1st	50	polynuclear cells	65 t. b.	average of 1.3 t. b. per cell
2d	"	"	" 83 "	" 1.66 " "
3d	"	"	" 70 "	" 1.40 " "
4th	"	"	" 63 "	" 1.26 " "
1st	100	polynuclear cells	148 t. b.	average of 1.48 " "
2d	"	"	" 133 "	" 1.33 " "
1st	200	polynuclear cells	281 t. b.	average of 1.41 t. b. per cell

EXPERIMENT 32, MARCH 29, 1906.

K.'s white blood corpuscles.... 1 vol.

T.'s serum..... 1 vol.

Suspension of tubercle bacilli 1 vol.

(The whole incubated at 37° C. for twenty minutes.)

1st	25	polynuclear cells	= 53 t. b.	average of 2.12 t. b. per cell
2d	"	"	" 51 "	" 2.04 " "
3d	"	"	" 45 "	" 1.80 " "
4th	"	"	" 56 "	" 2.24 " "
5th	"	"	" 27 "	" 1.08 " "
6th	"	"	" 49 "	" 1.96 " "
7th	"	"	" 38 "	" 1.52 " "
8th	"	"	" 27 "	" 1.08 " "
1st	50	polynuclear cells	= 104 t. b.	average of 2.08 t. b. per cell
2d	"	"	" 101 "	" 2.02 " "
3d	"	"	" 76 "	" 1.52 " "
4th	"	"	" 65 "	" 1.30 " "
1st	100	polynuclear cells	= 205 t. b.	average of 2.05 t. b. per cell
2d	"	"	" 141 "	" 1.41 " "
1st	200	polynuclear cells	= 346 t. b.	average of 1.73 t. b. per cell

EXPERIMENT 33, MARCH 30, 1906.

P.'s white blood corpuscles... 1 vol.

J. P.'s serum..... 1 vol.

Suspension of tubercle bacilli 1 vol.

(The whole incubated at 37° C. for twenty minutes.)

1st	25	polynuclear cells	113 t. b.	average of 4.52 t. b. per cell
2d	"	"	97 "	" 3.88 " "
3d	"	"	88 "	" 3.52 " "
4th	"	"	109 "	" 4.36 " "
5th	"	"	98 "	" 3.92 " "
6th	"	"	115 "	" 4.60 " "
7th	"	"	115 "	" 4.60 " "
8th	"	"	114 "	" 4.56 " "
1st	50	polynuclear cells	210 t. b.	average of 4.2 t. b. per cell
2d	"	"	197 "	" 3.94 " "
3d	"	"	213 "	" 4.26 " "
4th	"	"	229 "	" 4.58 " "
1st	100	polynuclear cells	407 t. b.	average of 4.07 t. b. per cell
2d	"	"	442 "	" 4.42 " "
1st	200	polynuclear cells	849 t. b.	average of 4.24 t. b. per cell

EXPERIMENT 33, MARCH 30, 1906.

T.'s white blood corpuscles... 1 vol.

K.'s serum..... 1 vol.

Suspension of tubercle bacilli 1 vol.

(The whole incubated 37° C. for twenty minutes.)

1st	25	polynuclear cells	100 t. b.	average of 4.00 t. b. per cell
2d	"	"	103 "	" 4.12 " "
3d	"	"	58 "	" 2.32 " "
4th	"	"	77 "	" 3.08 " "
5th	"	"	115 "	" 4.60 " "
6th	"	"	81 "	" 3.24 " "
7th	"	"	84 "	" 3.36 " "
8th	"	"	96 "	" 3.84 " "
1st	50	polynuclear cells	203 t. b.	average of 4.06 " "
2d	"	"	135 "	" 2.70 " "
3d	"	"	196 "	" 3.92 " "
4th	"	"	180 "	" 3.60 " "
1st	100	polynuclear cells	338 t. b.	average of 3.38 t. b. per cell
2d	"	"	376 "	" 3.76 " "
1st	200	polynuclear cells	711 t. b.	average of 3.57 t. b. per cell

A SUGGESTION IN THE TREATMENT OF HÆMOPTYSIS.¹

BY LAWRASON BROWN, M.D.,

RESIDENT PHYSICIAN, ADIRONDACK COTTAGE SANITARIUM, SARANAC LAKE, NEW YORK.

THE cause and treatment of pulmonary hemorrhage have interested physicians since the time "when the memory of man runneth not to the contrary." Its importance in pulmonary tuberculosis has long been known, though it is more recently that its true relation

¹ Read at the meeting of the National Association for the Study and Prevention of Tuberculosis, Washington, D. C., May 17 and 18, 1906.

to the disease has been established. Long a moot point in medicine, hæmoptysis has been held by many famous authorities, among them Hippocrates, Galen, Aretæus, Hoffman, Boerhaave, Van Swieten, Graves, and Niemeyer, as a precursor and even the cause of pulmonary tuberculosis. Opposed to them stood Richard Morton, Portal, Bayle, Laënnec, and Louis. Walshe, in the middle of the last century, showed clearly that Laënnec and Louis were correct in holding that in most instances symptoms preceded the hæmoptysis which should, therefore, be looked upon rather as the result than as the cause of the pulmonary tuberculosis. A few years later, 1868, Rasmussen, of Copenhagen, published in the *Edinburgh Medical Journal* his pathological researches upon the origin of hæmoptysis. He showed, as is well known, that fatal hæmoptysis proceeds from a ruptured aneurysm in a pulmonary vessel. Since then it has been clearly established that fatal hæmoptysis is due in practically all cases to the rupture of an aneurysm situated upon a branch of the pulmonary artery. Few, I might say almost no, well authenticated cases of fatal hæmoptysis have occurred from rupture of the pulmonary vein or of the bronchial artery. It has long been known that the walls of the pulmonary vessels are quickly attacked in tuberculosis. The endarteritis itself is usually obliterating. Even when this does not occur the vessel walls are thickened and immobile.

The pulmonary blood pressure may be affected by change in the calibre of the bloodvessels, in the greater or lesser circulation, by increased or lessened flow of blood, by change in the rate of circulation, and by failure of the left side of the heart to perform properly its function. Recent work has thrown much doubt upon the existence of vasomotor nerves in the pulmonary vessels and it is probable that, *cæteris paribus*, the pulmonary pressure is directly determined by the amount of blood supplied to the right ventricle.

Theoretically, hæmoptysis may be controlled by increasing the coagulability of the blood, by lessening the rapidity of its flow, by reducing the volume of blood in the weakened vessel, by lowering the blood pressure, or by constricting the affected vessel, which may act in one of the ways heretofore mentioned. Calcium chloride has not accomplished in my hands what I was led to hope for from Wright's experiments. Digitalis has often signally failed to be of any benefit. The pathological changes occurring in the pulmonary vessels in the diseased area preclude any changes in their calibre. All drugs, therefore, which cause a contraction of the bloodvessels, such as ergot or adrenalin, would, if they acted upon the pulmonary vessels, be directly injurious, as they would cause a contraction of the healthy vessels, and the diseased vessels, incapable of varying in diameter, would be subjected to increased instead of lessened tension. Recent experimental work, which has been mentioned, would seem to indicate that lessened tension

from dilatation of the other pulmonary vessels does not take place.

For these reasons we must seek elsewhere to regulate the pulmonary tension, and in considering the subject the first thought is to lower the tension by reducing the volume of blood in the circulation. All severe hæmoptyses act quickly in this way and in most instances render venesection useless and even dangerous. Another attempt in the same direction is ligation of the limbs, a modern modification of Junod's boot.

More recently, however, a group of substances has been brought into use which exert a very marked effect upon the blood pressure. I refer to the nitrites. Their action consists chiefly in producing a dilatation of the peripheral vessels, mainly of the head and neck, and of the vessels of the splanchnic area, causing a marked fall in the blood pressure while the heart is accelerated. The different members of this group vary in regard to the rapidity, the intensity, and the duration of their action. Amyl nitrite acts instantaneously, but only for about five minutes. Nitroglycerin, and in fact all the other nitrites, act less vigorously but much longer. Nitroglycerin acts more quickly and more intensely, but for a slightly shorter period than sodium nitrite. In both the action is well marked in fifteen minutes and lasts for one to two hours. Erythrol tetranitrate acts much more slowly and attains the height of its action in about two hours, but its duration is much longer.

Theoretically, amyl nitrite should be administered at once in the case of hæmoptysis and repeated if necessary in five minutes. Following the first dose nitroglycerin or sodium nitrite should be given, and in a few minutes (twenty to thirty) erythrol tetranitrate should be given. This would insure a lowered pulmonary tension for some time. The great difficulty, however, lies in the fact that it is difficult to tell just when to repeat the dose. It is dangerous to lower the blood pressure too much and dangerous not to lower it enough. To overcome these difficulties I have recently taken the patients' blood pressure¹ every two hours and ordered the doses accordingly, aiming to keep the tension within certain limits. Practically, I use amyl nitrite as suggested, and if the patient is nervous administer morphine (one-eighth grain) hypodermically and along with it nitroglycerin or, which I prefer on account of its greater stability and fewer untoward symptoms, sodium nitrite (one grain). In some cases the patient cannot inhale amyl nitrite, and in these cases the sodium nitrite or nitroglycerin should be given hypodermically, immediately, and repeated as often as necessary. A careful nurse may be quickly trained to take accurate readings of the sphygmomanometer and the cuff may be left upon the arm indefinitely if preferred. To determine at which level to keep the blood pressure I take it several times

¹ The systolic pressure only has been studied.

at short intervals and attempt to keep it usually between "100 and 115 or 120 mm. of mercury." It is comparatively easy to do this with the aid of sodium nitrite.

Hæmoptysis frequently recurs or even occurs in the early morning hours and the patient awakens spitting blood. Howell's theory of sleep offers a striking explanation of this phenomenon. This observer holds that sleep is due to the fatigue of the vasoconstrictor centre (or centres), and he has shown by the plethysmograph that a dilatation of the peripheral vessels occurs during sleep. In the early morning hours, when the vasoconstrictor centre is regaining its lost tone, remarkable vacillations occur in the plethysmographic records, which would indicate considerable variation in the quantity of blood supplied to the right side of the heart and, as we have mentioned before, concomitant variations in the pulmonary blood pressure. Sudden variations in pressure are, in all probability, more dangerous than a steady high pressure. To prevent these variations as much as possible and to equalize the blood pressure, I have recently given morphine and sodium nitrite hypodermically between midnight and 2 A.M., waking the patient if necessary.

Aconite has been suggested in the treatment of hæmoptysis and its use, when controlled in the foregoing manner, may prove to be very beneficial. I would suggest its use in cases complicated with fever.

To recapitulate briefly, I would suggest that the blood pressure be frequently observed, that morphine be used when necessary to quiet the patient and so equalize the blood pressure, that sodium nitrite be exhibited to reduce when necessary the blood pressure, and that in case of a sudden hæmoptysis amyl nitrite be administered at once when possible, to produce a marked fall in the blood pressure and so aid in a temporary cessation, at least, of the hæmoptysis.

In no symptom, or complication, as you wish it, is judgment of the effect of any treatment more difficult than in hæmoptysis. I am fully persuaded that many of our patients recover from hæmoptysis in spite of our treatment. I have had too few cases to hazard anything more than a tentative opinion upon the beneficial effects of this method of treatment. It seems to me, however, a little less empirical than many others and I submit it to you in the hope that any of you who think well enough of it will endeavor to establish its value or to prove its worthlessness.

A NEW INTESTINAL PARASITE OF MAN: PARAMŒBA HOMINIS.

By CHARLES F. CRAIG, M.D.,

FIRST LIEUTENANT, ASSISTANT SURGEON, U. S. ARMY; PATHOLOGIST AND BACTERIOLOGIST
TO THE U. S. ARMY DIVISION HOSPITAL, MANILA, P. I.

SINCE the brilliant investigations of Schaudinn¹ upon the morphology and method of reproduction of the amœbæ inhabiting the intestine of man were published, in which he demonstrated the existence of at least two species, one harmless and the other pathogenic, the study of these organisms has acquired new interest and importance. In a previous contribution² I have described in detail the results of personal work upon *Entamœba coli* and *Entamœba dysenteriae* (*histolytica*), all of which were confirmatory of Schaudinn's conclusions, and have since been so fortunate, during several months' work in the Philippine Islands, as to be able to study the peculiar amœba which will be described, and which, not only because it is a hitherto undescribed species for man, but on account of its complicated life cycle is of the greatest interest. This parasite is of rare occurrence, as I have observed it in but six cases out of several hundred patients whose feces I have examined. I have only observed it in natives of these Islands, although I have looked very carefully for it in American soldiers and civilians, some of whom have lived for a considerable period of time in the tropics.

OCCURRENCE. This amœba was observed in the feces of six natives who were patients in the hospital at the time the examinations were made. In five of the cases the only symptoms of importance present was a diarrhoea, the stools being of watery consistence, and containing in three of the cases a small amount of blood and mucus. In none of these cases was *Entamœba dysenteriae* present. The sixth patient was suffering from a very severe attack of acute amœbic dysentery, and the new amœba was found in small numbers in conjunction with immense numbers of *Entamœba dysenteriae* (*histolytica*). In one case *Trichomonas intestinalis* was present.

MORPHOLOGY AND LIFE CYCLE. Before describing the morphology of this parasite it will be necessary to sketch briefly its life cycle, for at different periods in the latter the morphology varies very greatly. This amœba, unlike any other hitherto described as infecting man, undergoes a flagellate and an amœboid stage of development, resembling in this the water amœba first described by Schaudinn and named by him *Paramœba ciliardi*. I have been able, by making repeated examinations, to trace the life cycle of this

¹ Arbeiten aus dem Kaiserlichen Gesundheitsamte, 1903, xix, Heft 3, p. 563.

² American Medicine, May 27, June 3 and 10, 1905, vol. ix., Nos. 21, 22, and 23, pp. 854-861, 897 903, 936 942.

amoeba in the intestinal contents, and while there are many points in connection with this cycle which require further study, especially as regards the intervals of time which elapse between the various stages of growth, enough has been observed to enable us definitely to place this organism in the same genus with *Paramoeba eilhardi*.

LIFE CYCLE. The new amoeba, as I have stated, is a flagellated organism during one stage of its growth, this stage being succeeded by a stage in which the true amoeba form is observed. In both these developmental stages reproduction is probably possible, although I have observed it only in the amoeboid stage; in this stage reproduction by simple division can be demonstrated (Fig. 1).

FIG. 1

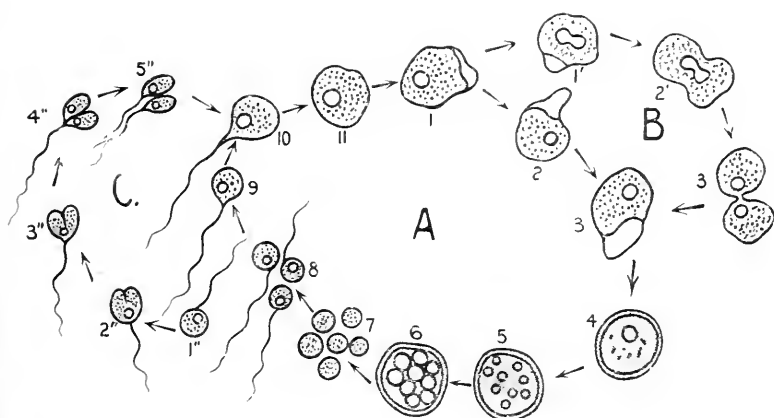


Diagram illustrating the life cycle of *Paramoeba hominis*: A, 1 to 11. The entire life cycle, showing the amoeba and flagellate stages, which has been observed. B, 1 to 3. Cycle of reproduction by simple division, which has been observed. C, 1 to 3. Cycle of reproduction, by longitudinal division of the flagellates, which is hypothetical.

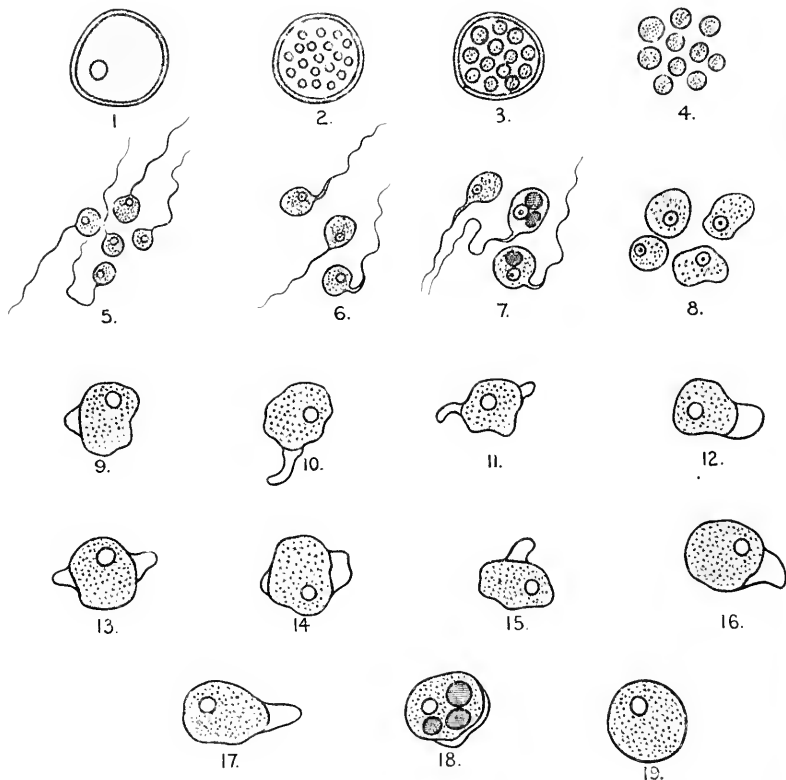
Beginning with the amoeboid stage, after the organism has reproduced an unknown period of time by simple division, the amoebae become circular in shape and there is developed a refractive, hyaline, double outlined cyst wall. Within the cyst so formed a number of small spherical bodies are produced, which are liberated by the rupture of the cyst, and which possess a long, delicate flagellum, and are actively motile. The flagellated organisms increase rapidly in size and eventually become motionless, lose their flagella, and develop into the true amoeboid form, after which they undergo reproduction by simple division for a period, and then become encysted, as has been described. Whether the flagellate form reproduces as such, as does *Paramoeba eilhardi*, I have not been able to determine.

MORPHOLOGY. Having thus briefly outlined the life cycle of this organism, the morphology as observed in its various stages of

development may be considered, beginning with the amœbic form at the time of encystment (Fig. 2).

Encysted Stage. At this time the parasite measures from 15 to 20 μ in diameter, and is circular in shape. It appears opaque and

FIG. 2



Various forms of the flagellate, cystic, and amœbic stages in the growth of *Paramoeba hominis*: 1, newly formed cyst, showing membrane and nucleus; 2, cyst showing absence of nucleus and a large number of small refractive dots; 3, cystic form, presenting within the cyst numerous young flagellates; 4, young parasites after liberation from the cyst and before the development of the flagellum; 5, young flagellates after the appearance of the flagellum; 6, older flagellate forms of *Paramoeba hominis*; 7, fully grown flagellate form of *Paramoeba hominis* (note the well-defined nucleus; two of the organisms contain red blood corpuscles); 8, flagellate forms immediately after the disappearance of the flagellum and before the appearance of amœboid motion; 9 to 18, various forms of the amœbic stage of *Paramoeba hominis* (note the well-defined nucleus, the differentiation of the ectoplasm and endoplasm, the blunt pseudopodia, and the granular appearance; in 18 the amœba contains three red blood corpuscles); 19, *Paramoeba hominis* at the termination of its amœbic stage, just previous to encystment.

is of a dull-gray color; no difference can be detected between the ectoplasm and endoplasm, the protoplasm appearing homogeneous; surrounding the organism is a delicate, very refractive capsule, having a double outline. In the earliest stage of encystment a nucleus,

spherical in shape and very small, is generally observed, situated a little to one side of the centre, but this nucleus entirely disappears at a later stage, being replaced by numerous brightly refractive dots which are scattered throughout the protoplasm. In some instances a smaller, oval body may be seen situated a little to one side of the nucleus; this is not so refractive. At a later stage the cyst appears to be crowded with small circular bodies which are undoubtedly the young flagellate organisms. The appearances described are those presented in fresh specimens. I have not been able as yet to stain the cystic forms successfully.

Young Flagellate Stage. While I have not been able to observe the actual rupture of the cyst wall, and the liberation of the young flagellated organisms, in all the cases observed I have found groups of such organisms, lying apparently in cellular detritus, and arranged in circular masses, corresponding in size to the original cyst, although the cyst wall had disappeared. At first these young organisms do not appear flagellated, are very small, measuring from 3μ to 5μ in diameter, are circular in shape, and have a finely granular protoplasm in which no nucleus can be demonstrated. After watching these young amoebae for a while it will be seen that one by one they become motile, a very delicate flagellum appearing at some portion of the periphery; they disengage themselves from the material in which they seem embedded, and move forward in a rapid, jerky way, propelled by the flagellum, which thus appears to be situated posteriorly. It is impossible to stain these young forms distinctively.

Fully Grown Flagellate Stage. The young flagellate forms increase very appreciably in size, and in all the specimens which I have examined, the intermediate stages in the growth could be easily traced, but as the morphology varies but little until the flagellate form has attained its full growth, it is unnecessary to give it in detail.

When fully grown the flagellate forms measure from 10μ to 15μ in diameter and are perfectly circular in shape, save at that portion of the periphery where the flagellum is attached. The latter is three to four times as long as the diameter of the parasite, and tapers very rapidly, the outer three-fourths being so extremely slender that it requires very careful focusing to demonstrate it. At the point of attachment to the body of the parasite the flagellum is continuous with the protoplasm, and the nucleus appears to be situated, in the majority of instances, near this point. The flagellum is situated posteriorly, and the organism moves forward rapidly, propelled by the flagellum, the motion of the latter being lashing in character. The protoplasm is homogeneous in greater part, but small refractive granules are often observed, and a small spherical nucleus, having a well-marked nuclear membrane, is usually present. I have several times observed from one to two red blood corpuscles within

the flagellate form, so that it is apparent that the property of engulfing these cells is not confined to the amœboid stage. As stated I have not been able to observe reproduction in this stage. Stained preparations, even when Wright's stain is employed, are not satisfactory, the organism staining a very dark purple color throughout, and the flagellum does not take the stain.

Young Amœbic Stage. Repeated observations of these fully grown flagellate forms demonstrate that after gradually becoming less motile, progressive motion is lost, and that after lashing around with the flagellum for a while, this also becomes motionless, and disappears, being either drawn within the body of the parasite or degenerating. With the disappearance of the flagellum, amœboid motion commences, appearing at first as an undulatory motion of the border of the parasite, followed by the projection of small, rather pointed pseudopodia. At first there is no progressive motion, the pseudopodia being projected and withdrawn rapidly, but they gradually increase in size and progressive motion begins; the motion is fairly rapid for an amœba, the pseudopodia being bluntly conical in shape, and as soon as they are projected the endoplasm flows rapidly into them. There is a distinct difference in the appearance of the ectoplasm and the endoplasm, the latter being more refractive than the former and much larger in amount. When the organism is motionless the ectoplasm and the endoplasm cannot be differentiated. A nucleus is present, refractive, spherical in form, and presenting a well-defined nuclear membrane. It is always situated in the endoplasm, and changes its position with the movements of the organism. Vacuoles have not been observed. One to two red blood corpuscles are occasionally seen in these young amœbæ. The endoplasm is finely granular in structure.

Fully Grown Amœbic Stage. After becoming amœboid, the parasite increases considerably in size, measuring when fully grown from 15 μ to 25 μ in diameter; the distinction between the ectoplasm and the endoplasm is well-marked when the organism is moving, but invisible when it is motionless; the nucleus is distinct and presents a heavy nuclear membrane; no vacuoles are present, but the endoplasm contains a great deal of granular material and often from one to four red blood corpuscles. When fully grown the motility is very marked and is progressive in character.

In stained specimens no difference can be detected in the staining reactions of the ectoplasm and the endoplasm, but the nucleus stains a brilliant red with Wright's stain, and appears to be composed almost entirely of chromatin.

Encystic Stage. In the amœboid stage I have repeatedly observed reproduction by simple division, but in the same specimen of feces numerous amœboid forms will be observed which are becoming encysted, as well as those in which the process is complete. The manner in which this organism becomes encysted is very interesting.

The amœboid motion gradually ceases and suddenly the organism begins to rotate very rapidly upon its axis, this rotation sometimes lasting for an hour or more.

It is probable that it is during this process of rotation that the cyst wall is formed, for when rotation ceases it is observed that the organism is surrounded by the delicate, double-outlined membrane which has already been described. After rotation has ceased the organism appears slightly smaller than while in the amœboid stage, and the nucleus is shrunken and in some instances is not distinguishable.

CLASSIFICATION. It is evident that the parasite described passes through an amœbic and a flagellate stage of development, and for this reason it cannot be placed in the genus *Entamœba*. The organism might be regarded as a connecting link between the amœbæ proper and the flagellates, but as Schaudinn has already described a very similar organism, occurring in water, and has placed it in the genus *Paramœba*, I am of the opinion that this new amœba of man should be placed in the same genus. While I have not been able to demonstrate reproduction by longitudinal division during the flagellate stage of growth, which occurs in *Paramœba eilhardi*, it is very probable that such a mode of reproduction occurs, for the other developmental stages of the new parasite are identical with those of *Paramœba eilhardi*.

For these reasons I believe that this organism may be properly placed in the genus *Paramœba* described by Schaudinn, and would suggest that the name *Paramœba hominis* be given this new intestinal parasite of man.

PATHOGENICITY. As to whether *Paramœba hominis* produces any pathological condition of the intestine, or whether it is a harmless amœba, as is *Entamœba coli*, I am not prepared to say. In all the cases but one in which it was observed its presence was accompanied by the usual symptoms of a severe diarrhœa, and it was the only animal organism present which could be looked upon as being of any etiological significance. In the one case it occurred in conjunction with *Entamœba dysenteriae*, and, therefore, it is impossible to say what part *Paramœba hominis* played in the infection.

DIFFERENTIAL DIAGNOSIS. There is but one intestinal parasite which might be mistaken for *Paramœba hominis*, because of certain peculiarities in its development. I refer to *Trichomonas intestinalis*. The latter organism is often observed in the resting stage, when it is circular in form, and appears to possess very limited amœboid motility. It is much smaller than *Paramœba hominis* at the beginning of the amœboid stage, and it does not possess active progressive amœboid motion, as does the latter. In the flagellate stage *Paramœba hominis* is distinguished from the trichomonads by the absence of the undulating membrane and the presence of one flagellum, as well as by its circular shape. It is impossible to confuse it with

the cercomonads, as it does not resemble these organisms in the least. It would be somewhat difficult for one who has not traced the development of *Paramœba hominis* to distinguish its amœbic stage from that of *Entamoeba coli*, but the presence in the same specimen of cystic forms, rotating forms, and various stages of the flagellate form makes the diagnosis of *Paramœba hominis* easy. In conclusion, I would call attention to the fact that this parasite has been found only in natives of the Philippine Islands, but that in all probability further research will show that it is much more frequently present than appears to be the case at present.

THE ACETONE BODIES: THEIR OCCURRENCE AND SIGNIFICANCE IN DIABETES AND OTHER CONDITIONS.

By T. STUART HART, A.M., M.D.,

INSTRUCTOR IN PHYSICAL DIAGNOSIS, COLUMBIA UNIVERSITY; VISITING PHYSICIAN TO THE SETON HOSPITAL, NEW YORK.

As our knowledge of the so-called acetone bodies, that is, acetone, diacetic acid, and β -oxybutyric acid, increases they assume a growing importance and interest in their connection with many pathological conditions. As symptoms of disordered metabolism they are of significant value. Their presence in diabetes and febrile conditions has been recognized for a considerable time. Their more recent discovery in operative procedures, pregnancy, digestive disturbances, nervous disorders, malignant disease, and various forms of poisoning has made them of interest to an ever-increasing number of the medical profession.

The graphic formulae of the acetone bodies at once indicates to us their close relationship.

β -oxybutyric acid.	Aceto-acetic acid (diacetic acid).	Acetone.
CH ₃	CH ₃	CH ₃
CHOH	CO	CO
CH	CH ₂	CH ₃
COOH	COOH	

By oxidizing β -oxybutyric acid we obtain diacetic acid:



and when diacetic acid is heated to 100° C. it is easily decomposed into acetone and carbonic acid:



The latter reaction occurs so readily that hitherto no satisfactory method has been devised of separating the acetone and diacetic acid of the urine, and, therefore, all quantitative estimations of acetone represent the combined output of diacetic acid and acetone. We are able, however, to estimate separately the amount of β -oxybutyric acid and the combined amount of acetone and diacetic acid.

The relationship of the acetone bodies is further made evident by the order in which they make their appearance in the urine in various pathological conditions. In a severe case of diabetes, for instance, the first of these bodies which we find is acetone, indicating that the organism is beginning to show its failing powers of oxidation; if this process advances we next detect diacetic acid, and when this has become evident in increasing amounts oxybutyric acid will finally be found, thus pointing out the increasing imperfection of oxidation. When the diabetic begins to improve the oxybutyric acid is the first to disappear, followed by diacetic acid, and lastly by acetone, but always in this sequence—thus indicating in a graded manner the increasing capability of the organization to carry out its normal processes of oxidation.

It seems to be pretty conclusively proved that β -oxybutyric acid is the antecedent body from which diacetic acid and acetone are formed. Schwartz (*Archiv f. exp. Path. u. Pharm.*, 1898, Band xxx.) has given diacetic acid by the mouth to diabetic animals and has seen a partial conversion into acetone in the urine. Gechnuyden (*Skand. Arch. f. Phys.*, 1901, Band xi.) has given sodium salts of diacetic acid to normal men, who were on a mixed diet and a diet without carbohydrates, and found an increase in the acetone output in each instance. It is not improper, however, in connection with these experiments to emphasize the fact that as regards the acetone bodies the metabolism of animals is very different from the metabolism of man; hence, conclusions from animal experimentation must be drawn with extreme caution. In this work in many instances the results obtained in animals have been found to be utterly different from those obtained in man in corresponding experiments.

It has been claimed by Arnold (*Zentralbl. f. inn. Med.*, 1900, p. 423) that the acetone of the urine is excreted as diacetic acid and is converted into acetone in the urine. It seems to me, on the contrary, that there is considerable evidence that acetone as such is excreted and may occur entirely independent of the excretion of diacetic acid. In a number of my own cases I have been able to detect and estimate the quantity of acetone in the urine without being able to detect diacetic acid by either Gerhardt's or Arnold's reactions, the latter being the most delicate reaction for diacetic acid which we possess. The following table shows a number of such instances:

CASES SHOWING PRESENCE OF ACETONE WITHOUT DIACETIC ACID.

Case.	Date of examination.	Diagnosis.	Acetone.		Test for diacetic acid.			
			Lieben's test.	Quantity in grams.	Arnold's.	Gerhardt's.	Diazo.	Riegler's
Cycle								
E. W.	April 14, '05	vomiting	+	..	0	0	0	0
L. B.	May 16, '05	Diabetes	+	..	0	0	0	0
	June 9, '05	Diabetes	+	0.220	0	0	0	0
A. C.	April 12, '05	Diabetes	+	..	0	0	0	0
B. B.	April 13, '05	Diabetes	+	..	0	0	0	0
E. A. S.	April 15, '05	Diabetes	+	..	0	0	0	0
C. C. K.	April 15, '05	Diabetes	+	..	0	0	0	0
	May 25, '05	Diabetes	+	0.018	0	0	0	0
L. H.	June 7, '05	Diabetes	+	0.021	0	0	0	0
M. E. M.	May 9, '05	Diabetes	+	0.017	0	0	0	0

Further, as regards Arnold's contention it may be said that in diabetes and other conditions a large amount of acetone is found in the breath, and diacetic acid is not found in the expired air; therefore, it would seem probable that acetone is present as such in the circulating blood.

However, when acetone appears in any considerable amount in the urine, diacetic acid can always be detected, and when in turn diacetic acid is evident in large quantities, as for example when we have an exceedingly strong Gerhardt reaction, oxybutyric acid is always found.

TABLE SHOWING APPEARANCE OF DIACETIC ACID WHEN ACETONE IS EXCRETED IN CONSIDERABLE QUANTITIES.

Case.	Date of examination.	Diagnosis.	Acetone tests.		Diacetic acid tests.				Rotation.	
			Lieben's.	Legal's.	Arnold's.	Gerhardt's.	Diazo.	Riegler's.	Amount of acetone in twenty-four hours, grams.	Before fermentation.
C. C. K.	May 25, '05	Diabetes	+	0	0	0	..	0.018		
M. E. M.	May 9, '05	Diabetes	+	0	0	0	0	0.017		
L. H.	June 7, '05	Diabetes	+	+	0	0	..	0.021x		
B. B.	April 25, '05	Diabetes	+	+	+	0	..	0.037x		
C. C. K.	April 27, '05	Diabetes	+	+	+	..	..	0.060		
L. B.	May 10, '05	Diabetes	+	+	+	0	0	0.068		
C. C. K.	June 13, '05	Diabetes	+	+	+	0	0	0.399		
F. J. M.	June 8, '05	Diabetes	+	+	+	+	+	0.160x		
L. B.	June 9, '05	Diabetes	+	+	0	0	0	0.317		
G. L.	May 1, '05	Diabetes	+	+	+	+	+	0.800		
S. C.	May 5, '05	Diabetes	+	+	+	+	+	0.616		
G. L.	May 15, '05	Diabetes	+	+	+	+	+	0.657		
G. L.	June 5, '05	Diabetes	+	+	+	+	+	1.113		
S. B. C.	May 3, '05	Diabetes	+	+	+	+	+	1.111x		
G. L.	May 8, '05	Diabetes	+	+	+	+	+	1.333x		
J. F.	Feb. 12, '04	Diabetes	+	+	+	+	+	0.292	+0.5	-1.2
J. F.	Feb. 22, '04	Diabetes	+	+	+	+	+	0.962	+6.0	-1.0
									+6.8	-0.4

+ = positive reaction. - = weak reaction. ? = doubtful reaction. 0 = negative reaction. x = amount in litre.

I think we may look upon the excretion of β -oxybutyric acid and diacetic acid as invariably due to pathological conditions, while the appearance of any considerable amount of acetone must be regarded in the same light. However, small amounts of acetone may be found in the urines of apparently perfectly healthy individuals. Von Jaksch (*Ueber Acetonurie u. Diacetonurie*, Berlin, 1895) found in normal men a urinary acetone excretion of 0.010 gram per day, and v. Engel (*Zeit. f. klin. Med.*, 1892, 20) puts the normal limits at from 0.006 to 0.018 gram of acetone a day. Most investigators claim that in normal subjects acetone is given out in the breath in infinitesimal quantities, but in pathological conditions more acetone may be found in the expired air than in the urine. Schwartz (*Verhdlgn. d. 18 Kongr. f. inn. Med.*, 1900) claims that 70 per cent. of the acetone may be excreted in the breath. Geelmuyden (*Zeitsch. f. physiol. Chem.*, 1897, Band xxiii.) has estimated that at times 80 to 95 per cent. of the acetone may be lost through the lungs. There seems to be no constant ratio between the amount of acetone excreted by the kidneys and the lungs. In pathological conditions, if the urinary acetone is increased and at another time diminished, the total acetone excretion may be constant, on account of the variability of the acetone of the expired air. In starvation experiments the urine may contain acetone, diacetic and β -oxybutyric acids, while acetone is found in considerable quantities in the breath. The acetone bodies are found in considerable quantities in certain digestive disturbances, and in many febrile diseases, such as the exanthemata, pneumonia, typhoid fever, etc. Acetone has not been found in the blood of normal men, but v. Jaksch found it in the blood in febrile cases; and in a diabetic Magnus-Levy (*Arch. f. exp. Path. u. Pharm.*, 1899, Band xlii.) found 0.1 to 0.3 per cent. of acetone in the blood. In pathological conditions acetone has been detected in the sweat and in the saliva.

Waldvogel (*Die Acetonkörper*, Stuttgart, 1903, p. 110) gives a list of the drugs which are known to increase acetone production; among them are benzol, benzonaphthol, antipyrin, morphine, and heroin. Acetonuria has been described by various authors as following poisoning with phosphorus, phloridzin, atropine, coal gas, curare, and lead. In some of these the cause may be found in the attendant starvation, vomiting, or other gastrointestinal disturbances.

Marro (quoted by Waldvogel, *Die Acetonkörper*, p. 108) claims that nervous shock and excitement can lead to an increased production of acetone bodies. He experimented by keeping a dog in a state of terror for eight hours and then could estimate a marked increase of acetone. It is a well-recognized fact that nervous excitement is bad for diabetics and may be the inciting cause of coma.

The acetone bodies have been detected in considerable amounts before and after operations. It is probable that this is largely due to

the restricted diet, nervousness, and vomiting, and not as many have supposed to the administration of the anæsthetic.

It was thought at one time that an acetonuria in a pregnant woman was an indication of a dead fœtus, but recent more extensive observations on acetone excretion before, during, and after labor have led to a modification of this view.

It is in diabetes that the excretion of acetone, diacetic and oxybutyric acids makes itself most evident and reaches its maximum. Magnus-Levy (*Arch. f. exp. Path. u. Pharm.*, 1899, Band xlii.) estimated in a case of diabetes a twenty-four-hour excretion of 19 grams of acetone, and in a case of diabetic coma, Naunyn found (Nothnagel, *Spec. Path. u. Ther.*, 1900, Band vii., 1, p. 185) an output of 188 grams of sodium β -oxybutyric acid in a single day.

An effort has been made, hitherto without success, to determine the particular organ of the body in which the acetone bodies are manufactured. In a diabetic subject, dying in coma, Hugoumenq (*Compt. rend. Soc. Biol.*, 1887) found a considerable amount of oxybutyric acid in the blood; in a similar case Magnus-Levy (*Archiv. f. exp. Path. u. Pharm.*, 1899, Band xlii.) isolated oxybutyric acid from the liver, spleen, muscles, blood, and stomach contents. Never, however, have acetone bodies been found in such amounts, in any particular organ, that their presence there could not be accounted for by the amount which might be brought to them by the circulating blood. A number of students of this subject, among whom perhaps Müller (*Verhandlun. d. Kongr. f. inn. Med.*, 1898) is the most ardent, regard the alimentary tract as the chief source of acetone-body production. They base their views mainly on the increase of acetone bodies in gastrointestinal disturbances, on the rapid action of carbohydrates when administered by the mouth in reducing the acetone formation, its failure to accomplish this result when given by the rectum, and the constant amount of sugar in the blood during starvation when the acetone bodies are notably increased. The preponderance of evidence seems to be against this theory. The clearing out of the alimentary tract by purgatives usually leads to a diminished output in an established acetonuria; in the stomach and intestinal contents these substances are never present in greater amount than in other organs; in fact, Magnus-Levy and Geelmuyden have found the amount less than in other organs in diabetic coma; in many gastrointestinal disturbances acetone bodies cannot be recovered from the urine, feces, or stomach contents. As was shown in the case of the famous faster Cetti, there is no parallelism between proteid destruction and acetone-body formation, which one would expect if there were a direct relationship between proteid decomposition and acetone production (Satta, *Beitrag. zur chem. Phys. u. Path.*, 1904 and 1905, vi., p. 390). Starvation acetonuria is a direct argument against the alimentary tract as its source, the large amount of these substances found in starvation and in subjects of diabetic

coma who are unable to take food, drives us to some other explanation of the source of acetone-body production.

It seems most probable that any part of the body which fails in the proper oxidation of the foodstuffs brought to it may be a source of acetone-body production.

The question next arises as to what is the antecedent material which failing to be oxidized completely in the various organs and tissues of the body results in the production of acetone, diacetic and oxybutyric acids. At various periods this role has been ascribed to proteids, carbohydrates, and fats, each in their turn. In the laboratory, by purely chemical agencies, acetone bodies have been obtained from each one of these foods. At present the evidence strongly indicates the abnormal destruction of fat as the source of excessive acetone-body formation.

The theory of the proteid origin of acetone bodies meets with many difficulties. There is no parallelism between the amounts of proteid destruction, as represented by the output of nitrogen, phosphates, and sulphates, and the amount of acetone bodies excreted. This has been pointed out by many observers in conditions of starvation and diabetes. Von Noorden (*Lehr. d. Path. d. Stoffuec.*, Berlin, 1893, p. 178) observed a patient on a reduction cure who daily converted 180 grams of proteid, but lost no weight, and excreted only a trace of acetone. Magnus-Levy (*Archiv f. exp. Path. u. Pharm.*, 42 u. 45) reports a case in which there was a metabolism of 262 grams of proteid in three days, out of which amount of proteid, at most, only an equal amount of oxybutyric acid could be made, and yet this patient excreted 342 grams of oxybutyric acid in this period. It is true that a patient on an exclusive proteid diet will produce considerable amounts of acetone, but it seems probable that this is due to the unusual destruction of body fat. Again, the administration of proteid food to a starving man reduces the amount of acetone excretion. This is probably due to its power to save fat destruction and also the influence of the carbohydrate moiety of the proteid which assists in the more complete oxidation of the acetone bodies.

As regards carbohydrates, their withdrawal from the diet of normal man is almost invariably followed by an increase in the acetone output and their administration results in a reduction of the acetone excretion. In many observations on diabetics a similar relationship has been demonstrated. It would not, therefore, seem possible that carbohydrates can be the source of the acetone bodies.

When we come to consider fats as a source of the acetone bodies the evidence is much better. There is a distinct parallelism between the amount of fat broken down and the amount of acetone bodies excreted. Loeb and Mohr (*Zentralb. f. Stoffuec. u. Verdkrankh.*, 1902) in a case of diabetes found that the amount of oxybutyric acid varied directly with the amount of fat in the food. Waldvogel

(*Die Acetonkörper*, p. 82) has found that by feeding fat in cases of diabetes, in starvation, and in those who for some time had been on an exclusive fat-proteid diet, the acetone output was notably increased. The administration of large quantities of fat to healthy subjects on a mixed diet is asserted by Schwartz (*Deutsch. Archiv. f. klin. Med.*, 1903, lxxvi.), Geelmuyden (*Zeit. f. phys. Chem.*, 1897, xxiii.), Schumann-Leclercq (*Dublin Journal of Med. Sci.*, September, 1901), and others to cause an increase in the excretion of acetone.

Starvation experiments on healthy men afford us considerable insight into the conditions necessary for the production of the acetone bodies. Mere deficiency in the caloric values of food is not sufficient to cause the appearance of an abnormal amount of acetone; for example, a man observed by Waldvogel (*Die Acetonkörper*, p. 117) took only 1.4 litres of beer and 750 grams of bread, without the appearance of acetone, and Rosenfeld (*Centralb. f. inn. Med.*, 1895, xvi.) reports a man who ate only 125 grams of cane sugar in twenty-four hours, with no increase in his acetone excretion. Total starvation may cause acetone production and an excretion of something less than one gram in twenty-four hours. A pure proteid diet in a healthy man may cause the excretion of considerable amounts of acetone but less than total starvation; in this case the acetone probably has its origin in the body fat. A pure fat diet may produce acetone values as great or greater than starvation. The extent of acetone excretion, as has been shown by Joslin (*Journ. Med. Research*, October, 1904, xii., No. 3), depends on the capability of the fat for absorption, hence on the character of the fat employed. A proteid-fat diet may produce acetone values approaching those of total starvation; here the source of the acetone is probably the fat both of the food and of the body. The addition of carbohydrates to any of the above diets at once reduces the acetone output; the rapidity of this action depends on the rapidity of the absorption of the carbohydrates and hence to a considerable degree upon the kind of carbohydrates employed. These facts may be tabulated, as follows:

EXPERIMENTS ON HEALTHY MEN.

No.	Diet.	Amount of acetone.	Probable source.
I.	Starvation.	Up to one gram in twenty-four hours.	Body fat.
II.	Exclusive fat.	More than I (usually).	Body and food fat.
III.	Exclusive proteid.	Less than I.	Body fat.
IV.	Proteid-fat.	About equal to I.	Body and food fat.
V.	Exclusive carbohydrate.	None.	
VI.	Carbohydrates and fat.	None.	
VII.	Carbohydrates and proteid.	None.	
VIII.	Carbohydrates and fat and proteid.	None.	

There has been considerable speculation as to the manner in which the introduction of carbohydrates acts in reducing the output of the acetone bodies. One of the very noticeable features of the reduction of this acetone output by carbohydrate introduction is the extreme rapidity of its action. The very suddenness of this in itself indicates that the first effect must be to furnish the conditions necessary for the complete oxidation of the acetone bodies at that time circulating in the blood. This is followed by a diminution in the destruction of body fat.

The difference in various carbohydrates in reducing an acetonuria has been shown by Jorns (*Inaug. Diss.*, Würzburg, 1903). After inducing an acetonuria in himself by a period of starvation he ate definite amounts of various kinds of carbohydrates; the greatest effect in diminishing the acetone was produced by the ingestion of cane sugar, followed in order by grape sugar, glycuronic acid, and starch. This is probably due to the varying absorbability of the different substances. Satta has noted a marked reduction in starvation and diabetic acetonuria following the administration of levulose and galactose.

Other substances which interfere with the production of the acetone bodies are glycerin, lactic and tartaric acids, and glycol. These may act directly, or may be changed into sugar by a synthetic process.

ACETONE BODIES IN DIABETES.

The study of the acetone bodies in diabetes is not only of extreme scientific interest, but also has a most important bearing on the therapeutic measures to be employed. As has been previously pointed out the amounts of these bodies excreted reaches a greater total in diabetes than in any other known conditions. The relative amounts of acetone, diacetic and oxybutyric acids may vary extremely in various stages of the disease. In the early stages acetone is the first of these bodies to be excreted. Later diacetic acid appears, followed by the excretion of β -oxybutyric acid. In the advanced stages of the disease, when oxybutyric acid is excreted in enormous amounts, the acetone may appear in comparatively small quantities. This change is due to a gradual decreasing power of oxidation of the body cells or their products. When it is possible to improve the metabolism the acetone bodies disappear in the inverse order in which they were discovered.

The ratio between the acetone of the urine and that of the breath in diabetes is not constant. As a rule in mild diabetes the acetone of the breath is relatively greater, in severe cases the acetonuria usually predominates. This may be explained by the fact that in the severe cases β -oxybutyric and diacetic acids are manufactured

and can only be excreted by the kidneys, and in the urine the diacetic acid is estimated as acetone, while in the cases in which acetone alone is made, this is readily excreted by both lungs and kidneys. Moreover, in the very severe cases of diabetes the body is unable to oxidize its diacetic and oxybutyric acids to acetone, and comparatively little of the latter is manufactured. In diabetes there is no parallelism between the amounts of sugar and acetone bodies.

The main source of acetone bodies in diabetes is the imperfect metabolism of fat, which may be the fat of the food or the body fat. As a rule the addition of carbohydrates to the diet results in a diminution of the acetone output; its withdrawal increases the acetone excretion. This is more evident in mild cases; among the very serious cases there are many exceptions reported. It seems to be evident that when the capability of oxidation of the body is not too much out of order, the presence of a certain amount of carbohydrate aids in the oxidation process and protects from destruction the fat which we believe to be the main source of the acetone. Fat feeding, however, seems to be a frequent occasion for the increase of the acetone bodies. This has been conclusively demonstrated by Schwartz (*Deutsch. Archiv f. klin. Med.*, 1903, No. 76) and others.

The loss of power of oxidation in the diabetic has been shown by Waldvogel (*Die Acetonkörper*, Stuttgart, 1903, p. 236). When he injected β -oxybutyric acid subcutaneously in cases of mild diabetes the output of acetone was considerably greater than in similar control experiments on healthy men.

Fever in the diabetic usually reduces the output of sugar and increases the excretion of the acetone bodies, but the usual custom of a change of diet in febrile conditions may possibly account for some observations made in such cases. A similar relationship has been shown to occur just before coma, with a terminal pneumonia (Dreschfeld, *Brit. Med. Journ.*, August 21, 1886). Narcosis seems to have the same tendency, and a fatal coma has been reported in such cases by Hoffa (*Münch. med. Woch.*, 1888) and Fütte (*Deutsch. med. Woch.*, 1903).

In coma oxybutyric acid is always present, acetone and diacetic acid may be relatively diminished, and sugar absent; this is probably due to the inability to take food or to utilize that which is taken; the powers of oxidation of the organism have fallen to such a degree that oxybutyric acid is no longer converted into diacetic acid or acetone.

A diabetic may excrete oxybutyric acid for a long time before the fatal issue. Von Noorden (*Die Zuckerkrankheit*, Berlin, 1898) observed such a case for two and one-half years; Weintraud (*Arch. f. exp. Path. u. Pharm.*, 1891, Band xxxiv.) reports a patient who excreted all three acetone bodies for a period of four years before death. I have two patients at present under observation, both of whom showed oxybutyric acid in the urine over two years ago.

It has been customary to regard diabetes as a disease characterized by a failure of the organism properly to utilize the carbohydrates. It seems to me that with our present knowledge we should take a broader view and include in our definition a failure of the organism properly to utilize fats. In every advanced case of diabetes we find an excretion of the acetone bodies, that is to say, the diabetic is unable to utilize fats properly. It is true that the failure to assimilate carbohydrates usually results in a disturbance in the metabolism of fat, hence some might look upon the disorders of fat metabolism in the diabetic as a secondary result of his inability to assimilate carbohydrates; but I believe it is more than this, and that there is a direct perversion of the metabolism of fat comparable to the well-recognized perversion in the metabolism of carbohydrates. In health the very insignificant quantities of carbohydrates will serve to abolish the production of acetone bodies; in certain cases of diabetes, on the other hand, even when a considerable amount of carbohydrates can be utilized, acetone bodies are excreted in spite of the addition of carbohydrates to the diet. In normal man, while acetone bodies are excreted when they are at first put on a proteid-fat diet, the abnormal products of metabolism disappear as the organism in time adapts itself to the new conditions. This has been proved experimentally, and is also illustrated by the fact that the Esquimaux, who subsist almost entirely on fat and proteids, do not have acetonuria. Furthermore, in the carnivora, *e. g.*, a healthy dog, it is almost impossible to produce acetonuria. In severe diabetes, on the other hand, the organism seems to be unable to adapt itself to a diet thus limited, and acetone bodies continue to be excreted.

Is it not then a truer and broader view to look upon progressive diabetes as a disease characterized by a failure to oxidize both carbohydrates and fats?

PRACTICAL SIGNIFICANCE OF ACETONE BODIES.

The recognition of the acetone bodies is of great practical value. If produced in any considerable quantity they are positive evidence of improper metabolism. They are not only of value as an important diagnostic and prognostic sign, but are also a material aid in keeping track of the change in the patient's condition from day to day, and in estimating the value of the therapeutic measures employed. Investigation of the acetone bodies in the urine should be found useful in the study of the dietary of institutions; here the utilization of Legal's reaction is simple and delicate enough to indicate, if found positive in a large number of inmates, that the dietary is insufficient.

To the alienist the detection of acetone may be evidence of a starvation which has been suspected.

In establishing starvation as a cause of death, the presence of acetone and diacetic acid in the urine would be strongly corroborative.

The prognosis of all chronic diseases associated with tissue destruction is more serious if there is a constant acetonuria. For example, in malignant disease the lack of utilization of the food and the destruction of body fat will often thus make itself evident.

Urinary examinations before and after operations and confinement ought to include a test for the acetone bodies.

If a diabetic should put himself on a diet free from carbohydrates in order to obtain life insurance, the examiner might suspect this if an acetonuria were detected, and further tests could readily be made to decide whether he had to deal with a diabetic.

In following a case of diabetes observations on the acetone-body excretion are as important as a knowledge of the sugar output. As soon as diacetic acid appears in the urine, however small may be the amount of glucose excreted, we should recognize that an extensive and improper fat metabolism is in progress. The appearance of oxybutyric acid heralds the fact that the cells of the organism are burning its fuel even less well, that a condition of acid intoxication is imminent, and that coma, however remote, may threaten at any moment.

It would be greatly to our advantage if at a comparatively early stage we could apply some less tedious and complicated test of the powers of oxidation of the diabetic, than the laborious method of long-continued modifications of the diet. This Waldvogel (*Die Acetonkörper*, Stuttgart, 1903, p. 271) has proposed to do, by giving the patient subcutaneous injections of sodium β -oxybutyric acid and thus ascertaining how completely he is able to oxidize a given quantity. It is easy to recognize some possible dangers in a procedure of this kind, and I have hesitated to employ it.

PROPHYLAXIS AND THERAPEUTICS.

The question finally presents itself as to what, in view of our present knowledge, we can do to prevent the formation of acetone bodies and to ward off the injurious effects of their presence. We have seen that nervous irritation, excitement, hunger, and fever favor the production of these poisons. All these should be avoided as far as possible. If operative procedure is necessary in a patient with acetonuria, local anesthesia should be used, if feasible; if a general anæsthetic must be employed, starving before and after the operation should be reduced to the minimum; if vomiting follows, bicarbonate of sodium and hot lemonade made with sugar should be given by

the mouth or the rectum. Similar rules should be applied in confinement cases.

In febrile conditions, particularly in the diabetic, the diet should include a certain amount of easily absorbed carbohydrates, and every effort should be made by baths and other simple measures to reduce the temperature.

In the diabetic if the withdrawal of carbohydrates is indicated one should do so gradually, allowing the patient time to accustom himself to the change, at the same time watching the amount of fat that can be used with impunity. In a mild diabetic one need not fear the increase of acetone which appears immediately after the withdrawal of carbohydrate food; this occurs in the healthy individual, but one should beware if a large amount of acetone is persistently excreted when the patient has had time to get used to the new diet.

There is at present considerable difference of opinion as to the effect of various kinds of fat on the excretion of the acetone bodies, but the weight of evidence indicates those fats containing the lower fatty acids to be the ones which increase most markedly the production of acetone bodies. Accordingly in selecting our fatty foods we should select, as far as possible, those containing only the higher fatty acids.

If in spite of our efforts we have been unsuccessful in checking the production of diacetic and oxybutyric acids we must resort to the administration of alkalis with the hope of neutralizing them and rendering them less harmful. At the same time we should attempt to aid their more complete oxidation by giving easily oxidizable carbohydrates, for which purpose cane sugar in solution seems to act best. It should be given by the mouth; if coma makes swallowing impossible, a stomach tube or nasal catheter may be used.

Large amounts of water by the mouth, hypodermoclysis, and continuous irrigation of the colon may serve to dilute the poisons and stimulate the kidneys to assist in their rapid removal from the circulating blood. In coma bleeding may be found of service.

THE RELATIONS OF CHRONIC VILLOUS POLYARTHRITIS TO THE DUMB-BELL SHAPED BACILLI.

BY PROFESSOR MAX SCHUELLER,
OF BERLIN.

ROADES FAYERWEATHER, in an interesting article entitled, "Infectious Arthritis, a Bacteriological Contribution to the Differentiation of the Rheumatic Affections," which appeared in *THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES*, December, 1905, referred to my distinction of articular inflammations according to, or

corresponding with, bacteriological, anatomico-pathological, and clinical observations and studies, which distinction I had planned first in the year 1897 and completed later on.

Dr. Fayerweather partly confirmed me in my descriptions, but to some extent he does not interpret my views correctly. The erroneous statements of Dr. Fayerweather I cannot leave undisputed, since I am the one who has advanced the new point of view in classifying diseases of joints.

First of all I cannot agree with Dr. Fayerweather when he applies the too insignificant term "infectious arthritis" instead of my own designation "polyarthritis chronica villosa (bacillaris)," for which latter name I have given scientific reasons. Some of Fayerweather's errors are due to the fact that he has drawn conclusions from his own observations made on comparatively scanty material, and has not taken into consideration the result of my investigations, for which I had a hundred times as much material at my disposal to make cultures. It is apparent that Fayerweather does not know all my publications on this subject, nor my writings on diseases of the joints in general. Concluding his article, Dr. Fayerweather invites further researches on the bacteriology of the articular affections under consideration, and in this I concur with him. I wish, however, to call attention to the scientific standpoint on the broader basis given in my own work on *Diseases of the Joints*, the significance of which for the topic will be readily understood.

As long as twenty-eight years ago—I was at that time clinical assistant and collaborator of Professor Carl Hueter, and we had a very large number of cases of joint diseases at the surgical clinic at Greifswald—I was led to make numerous clinical, pathological, anatomical, and bacteriological investigations of these diseases, and to experiment on animals in order to study the causes, the origin of the different forms of arthritic inflammations. The researches were published in different journals and formed also part of my book: *Experimentelle und histologische Untersuchungen über die Entstehung und Ursachen der skrophulösen und tuberkulösen Gelenkleiden, nebst Studien über die tuberkulöse Infektion und therapeutischen Versuchen*.

Since my removal to the University of Berlin I have studied several years, with Professor Rudolf Virchow's kind consent, in the Berlin Pathological Institute, a very large number of bodies, especially the joints, for different joint diseases, anatomically, histologically, as well as pathologically. My results were published at intervals in medical journals, in papers read in scientific sessions, among others before the Congress of German Surgeons in the year 1884. Again at that time I experimented on animals by inoculating cultures of different micro-organisms, especially such taken from metastatic inflammations of puerperal fever, but also from otherwise diseased joints. Not only by these studies, but more so by constantly increasing

clinical observations—in the average during the year from 500 to 600 patients afflicted with joint disease were treated by me in private clinical and astyclinical¹ practice—I became convinced that the existing classifications of articular inflammations of Volkmann, Hueter, and the English and French authorities were untenable. Some of these old classifications were made on the basis of anatomical changes; some surgeons had been quite arbitrary in classifying, some illogical in considering accidental causes; altogether they were unsatisfactory in every direction from a scientific and practical point of view.

For this reason I made the attempt to group the inflammations of the joints more correctly and more practically, comprising always the etiological moments, the pathologico-anatomical changes, and the most important clinical symptoms. According to these leading points of view I considered in my book, *Die Pathologie und Therapie der Gelenkentzündungen*, published in the year 1887, under the following head groups:

1. Simple acute serous arthritis;
2. Simple chronic serous arthritis (hydrarthron);
3. Suppurative arthritis; suppuration of joints;
4. Arthritis in acute infectious diseases, "metastatic arthritis;"
5. The rheumatic arthritis: (a) acute articular rheumatism; (b) chronic rheumatic monoarticular inflammation; (c) chronic rheumatic polyarticular inflammation;
6. Senile arthritis;
7. Arthritis deformans;
8. Gouty arthritis: (a) acute; (b) chronic;
9. Syphilitic arthritis: (a) in the secondary, (b) in the tertiary period, (c) in hereditary syphilis;
10. Tuberculous arthritis;
11. Neuropathic arthritis.

I defined and characterized every group as distinctly and precisely as possible, in order to enable us to arrive at a clinical diagnosis of every form of arthritis, and to establish therapeutic rules corresponding with etiological conditions, the most important anatomico-pathological changes, and the clinical symptoms.

My own observations and studies of a great many cases in private, clinical, and astyclinical practice, on the one hand, and the confusion existing and manifested in public discussions among the internal clinicians and spa physicians in regard to the conception and designation of diseases of the joints, on the other hand, induced me to establish a clearer discrimination of what is understood by rheumatic processes in the joints, sometimes attributed to rheumatism in the joints, sometimes called arthritis deformans, sometimes confounded with gout.

¹ Not policlinical nor polyclinical, because both these names are wrong, according to Rose.

In the year 1892 I discovered a peculiar, very small, plump bacillus in the tissues of some joints filled with villous excrescences; because of its peculiar shape I gave it the name dumb-bell bacillus. Characteristic were in such cases the clinical symptoms, the anatomico-pathological peculiarities, the presence of multiple or many villous excrescences on the whole inner surface of the synovialis, the typical structure of proliferating endothelial cell groups *surrounding numerous small vessels*, and differing from those in tuberculous tissue, and the presence of many dumb-bell shaped bacilli between and in the cells of the newly grown hyperplastic tissues of the synovialis and the villous excrescences. The additional fact that I had succeeded by experimenting in causing the same villous process on the synovialis in joints of animals by means of injections of pure cultures of the dumb-bell bacilli, while many other experiments made by me with other bacteria had never resulted in villous excrescences; in short, all these clinical and bacteriological reasons determined me to distinguish between this form and other forms of arthritis and to describe it as chronic villous bacillary inflammation.

We have, it is true, villous excrescences in other forms: for instance, in arthritis deformans, sometimes in syphilitic and sometimes in neuropathic arthritis, etc.; but I could demonstrate, for example, by means of careful histiochemical and physiological investigations, that in arthritis deformans all those changes which can be easily demonstrated in the living by means of Roentgen rays, and which have been characterized by Virchow, Barwell, and Volkmann as the result of puffing, blowing up, disrupting, grinding, polishing, leading to deformation of the cartilaginous parts of the joints, do not depend on the presence of bacilli but on pathological changes in the process of resorption and secretion of lime. It is the anomalous secretion of lime, principally in the cartilaginous, later also in the synovial tissues of the joints, which leads to necrotic changes in microscopic spots and to a simple inflammatory reaction and small cell proliferation beneath these spots, but not those foci around small vessels, as in the chronic bacillary villous process.

I was enabled to demonstrate this by histiochemical conversion of the surplus of lime into the characteristic crystals of lime oxalate in the cartilage as in the less numerous solid and hard synovial excrescences of arthritis deformans. As a matter of fact they are not necessarily present and not a characteristic feature in arthritis deformans. I had taken many photomicrographs of slices of arthritis deformans as well as of slices of characteristic villous excrescences and of synovials from chronic bacillary villous synovitis, and presented them before the Hufeland Medical Society on July 6, 1899. The paper read on that occasion, with illustrations, appeared in the *Berliner klin. Wochenschrift*, 1900, Nos. 5, 6, and 7, and was entitled "Polyarthritis Chronica Villosa and Arthritis Deformans." I could convince myself later on that neither the hard villi in arthritis

deformans nor those in pure syphilitic cases, nor the rarer ones in other forms of arthritis had dumb-bell shaped bacilli, with one exception, namely, in some cases of chronic villous polyarthritis in joints which at a former period had undergone syphilitic changes. Here I found the characteristic villous excrescences with dumb-bell bacilli, beneath them occasionally deep lacunous defects or flat cicatrizations in the cartilaginous or osseous parts of the joint, and these conditions were seen not only directly at operation on such joints, but even by means of Roentgen rays. In these cases there were also present syphilitic parasites, although, judging from their hyaline condition, syphilis was no longer active in these joints. Antisyphilitic treatment in such cases had no effect. It is possible that preceding syphilis, tertiary as well as hereditary, had given a predisposition to invasion of dumb-bell bacilli into the joints.

I do not know of any special relation of chronic villous polyarthritis to articular rheumatism. Among the great number (230) of my own observations I found only very rarely cases with a history of acute articular rheumatism. In the great majority of the cases the affection began *per se* instantaneously, with villous excrescences which progressed slowly. The process took place first in one or in a few joints, as a rule at first in the smaller ones, then gradually in others; sometimes, however, larger joints—the knee for instance—were the first. In my large experience with this form of arthritis I could establish with certainty that it never began with fever and swelling. I do not believe that the well-studied disease, which we are accustomed to call acute articular rheumatism, is ever caused by invasion of dumb-bell bacilli. In my earlier experiments I succeeded occasionally in producing acute serous or seropurulent inflammation of several or nearly all joints in animals, which inflammation resembled acute rheumatism, by injecting cultures of bacteria, especially streptococci, pyogenic, septic (puerperal fever), and others, never, however, by injecting cultures of dumb-bell bacilli. In later publications¹ I distinguished positively between rheumatic arthritis (acute articular rheumatism, chronic rheumatic arthritis), polyarthritis chronica villosa (bacillaris), and arthritis deformans.

Chronic villous polyarthritis bacillaris in men begins usually with the development of villous excrescences. I have often convinced myself of this fact. The growing villous excrescences originate always from distinctly known parts of the synovialis, first described by me as peculiar to every joint, but they grow generally in one direction more massive, and pull, therefore, as a rule the capsule of the joint more in one direction than in other directions. This asymmetric extension of the capsule by the growing villous excrescences is quite a characteristic feature of the chronic villous bacillary polyarthritis. In most cases the villi can easily be felt. The cartilagi-

¹ Zur Behandlung einiger chronischer Gelenkleiden. Mediz. Wochens., 1903, No. 30. Arthritis, Encyclopädie der praktischen Medizin, Wien, 1905.

nous parts of the joints remain unchanged, as can easily be seen in operation and by means of the Roentgen rays. There is the one exception, however, namely, in cases of preceding syphilitic gummatous destruction of the cartilaginous and osseous parts, of which I have spoken above. These destructions can also be differentiated by means of Roentgen rays from the deformations of arthritis deformans. The outside appearance of joints affected by chronic villous bacillary polyarthritic inflammation present, it is true, likewise more or less deformity in many instances, but the type of this deformity is as a rule of quite a different kind from that of the deformity in arthritis deformans. Moreover, there are the different clinical symptoms which characterize the one form and the other, and thus there is no difficulty in distinguishing chronic villous bacillary polyarthritic inflammation. Characteristic, for instance, is the lateral roof-tile deviation of the fingers when the metacarpophalangeal joints are affected. This peculiarity is caused by the one-sided protruding growth of the villous excrescences and the very early marked atrophy and palsy of some muscles and nerves.

In the shoulder-joint larger excrescences are rarely noticed. Here I found more often the cicatrizing form, which I call ankylopoietica, while the other form is named hyperplastica. Both forms are, as I could establish by histological and bacteriological examinations, of the same origin and are not seldom found together in different joints of the same patient.

In the elbow-joint the process begins, as I observed, very often in the synovialis under the ligamentum annulare around the head of the radius, and can be diagnosticated here very distinctly by careful palpation. The anterior and posterior cavities of the humerus are likewise the seat of this development, and here they interfere at an early period with articular movements.

In the hand the little joint between the ulna and the radius, as well as the wrist-joint, are affected by the disease, and here it can be easily and early diagnosticated.

The hip-joint is attacked mostly in very severe cases; here it causes fixation in the state of extension.

The knee-joint is very often affected and can be filled with the larger masses of villous excrescences. I am certain many cases described in literature as lipoma arborescens were in reality villous polyarthritic. The asymmetrical chunky swelling of the joint and the perception of the villi by digital examination facilitate the diagnosis in old cases. But even in recent cases, especially in those near the lateral ligaments and in the circumference of the patella and the ligamentum patellæ, we may notice the first formations of villous excrescences. Those behind the lateral ligaments will early give rise to trouble, pain on digital pressure, and in females sometimes swelling during the time of the menses.

The changes in our affection present quite another picture from,

for instance, those of tuberculous or syphilitic arthritis. Troubles in walking appear at an early period as a rule, but swelling in tuberculosis is usually more diffuse, besides being nearly always connected with a tuberculous focus in some osseous part of the joint, as can be detected by careful Roentgen-ray examination. Roentgen rays may also serve to distinguish between chronic villous polyarthritis and arthritis deformans in cases in which there exists any doubt. Very often, however, the experienced surgeon, simply by means of inspection, palpation, motion, examination for friction sound, etc., will have no difficulty in regard to differential diagnosis.

In the ankle-joint the villous excrescences are mostly found at the outer part of the articulation near the malleolus externus and also near the margin of the cartilaginous surfaces.

In order to arrive at a diagnosis in a case of chronic villous polyarthritis bacillaris we need not necessarily resort to a bacteriological examination, since the symptoms which I have described in my publications, and which I have briefly enumerated here, are very characteristic. I demonstrated, however, in 150 out of my 230 cases the presence of dumb-bell bacilli.

I made cultures from aseptic punctures of unopened joints with a special puncture needle and also from all my operated cases (30). In some cases I excised villous excrescences and parts of the synovialis, placed them between aseptically cemented sterilized glass shells and then in the abdomen of living rabbits, examined them ten to fourteen days later; or placed them in sterilized tubes closed by rubber stoppers in the thermostat, kept them there for a few days at a temperature of 37° to 37.5° C., and then made cultures from these particles on different culture media; or I made cultures after centrifugation of fluid taken under aseptic precautions from a diseased joint. Besides, I made in all cases operated on, and in hundreds of cases treated by injection, dry cover-glass preparations. I am in possession of a large collection of microscopic sections of tissues taken from my operated cases, of cover-glass preparations, and of cultures made after I had experimented with the bacilli on animals, and had many photomicrographs made.

Dr. Fayerweather believes, as stated in his article, that the bacilli which he found in his few cases were not the same as those described by me; but it has to be emphasized that he refers only to my first publication of cultures and experiments on animals from the year 1893, and not to all my later writings. At that time (1893) I was in about the same position as he is now. I had made only a few cultures of bacilli taken from joints affected with our disease and few experiments on animals. I did not, however, give my first observations as conclusive ones, but reserved my opinion until further investigation. As stated already, my observations extend now over 230 cases, which I have studied and described as mentioned above.

In regard to the cultures of dumb-bell bacilli, I wish to reiterate from my last publication that I always stain with Gram. In exceptional cases I found that cultures under Gram treatment would turn a little paler, but they never became discolored. There may arise some misinterpretation in regard to this point by those who have read only my first communication of 1893, in which I speak of easy staining and decoloring, but this refers essentially to some coloring of the cuts and cover preparations with following simple alcohol washing, not to the staining with Gram, which gives, as stated, no difficulty.

The dumb-bell bacilli, according to latest measurements which I took last summer¹—and I had a large collection of my own cultures of microscopic preparations, to serve for my purpose—showed the following proportions: length 1 to 2 to 4 μ , width 0.25 to 0.75 μ .

After repeated inspection of many microscopic preparations of slices, cultures, dry cover-glass specimens, taken from patients as well as preparations taken from joints, blood-cultures from animals, I am certain that the name I have given to the bacillus causing polyarthritis chronica villosa in the joints, although not conspicuously adaptable in every specimen, characterizes without question, in the greater majority, very well the form of the bacilli, and, therefore, I wish to suggest to retain this name "dumb-bell shaped bacilli" exclusively for the bacilli of polyarthritis chronica villosa.

In some exceptional cases they are very short and clumsy with only a light compression in the middle, so that they resemble somewhat gonococci, but they become stained with Gram, while the gonococci will be decolorized by Gram; besides the thick, short forms develop the longer dumb-bell shape as soon as they grow on a suitable culture soil. The same applies to the other varieties of the form which seem to be influenced by the different conditions of nutrition, as well in tissues of men and animals as in the culture soil.

In other exceptional cases they resemble diplococci, but as a rule the dumb-bell shape is very striking, with roundish poles and a middle part. The middle part may be short or unusually broad; there are found also sometimes specimens in which the lateral parts are more rod-like, etc. Sometimes they lay singly, sometimes they are arranged regularly, two by two, like diplobacilli, etc. Since I found the different forms and relations not only in the tissues of the same case, but very often in different cultures and in different soils, and found that the different forms originate from bacilli of one and the same first or typical form, and as this fact became confirmed very often in my cases, as for instance again in a case of disease of the knee joint in a man of fifty years, operated on a few months ago, I cannot think that these modifications of form cor-

¹ Berlin, klin. Wochenschr., 1905, No. 40.

respond with different kinds of bacilli, but I am convinced that they all are the same original bacilli which I have named dumb-bell bacilli of polyarthritis chronica villosa.

Comparing the culture table of Dr. Fayerweather given in his article with many cultures, I think that his Bacillus 1 and Bacillus 3 are identical with my dumb-bell bacillus; form, measure, staining by Gram are the same; in addition many of the culture properties are almost the same as far as I can judge. His Bacilli 3 and 4, decolorized by Gram, must be excluded, and the cases from which they were taken are not cases of polyarthritis chronica villosa.

In excluding those cases we exclude the supposed etiological connection of polyarthritis chronica villosa with acute articular rheumatism, to which latter class belongs Fayerweather's fourth case; it has nothing to do with the disease which I call polyarthritis chronica villosa.

It is true, however, as pointed out before, that joints which at sometime previously have been the seat of rheumatism may likewise become the seat of a chronic villous bacillary process, exactly as it may well happen that at some remote period a gonorrhoeic or other form of arthritis existed in these joints; but such occurrences are rare, and when they happen, we may find in the joint beneath the dumb-bell bacilli small accumulations of gonococci or other pyogenic bacteria. I have had some such cases under observation. Some months ago I operated on the knee joint of a patient, and in this case I at first believed that there existed a complication: dumb-bell bacilli and gonococci together, when I recollected that nine years ago I had operated on the other knee joint of this patient—with best success as to mobility—and at that time had found numerous rather long dumb-bell shaped bacilli. Staining with Gram and cultures, which I made after the last operation, proved the error: there were no gonococci, but only dumb-bell bacilli.

Summing up, I wish to say that I am convinced the disease which I described as polyarthritis chronica villosa is caused only by the bacillus which I have called dumb-bell shaped, and not by any other kind or form, and that this disease has no near etiological relations with acute rheumatic arthritis. It is to be hoped that my statements given in this paper will induce others to make further investigation. I shall be especially gratified if American colleagues will follow Dr. Fayerweather, to whom I am thankful for his interest in my labors, in studying the matter on a larger scale.

PEPTIC ULCER OF THE ŒSOPHAGUS.

BY WILDER TILESTON, M.D.,

ASSISTANT VISITING PHYSICIAN, LONG ISLAND HOSPITAL, BOSTON; CONSULTING PHYSICIAN,
MASSACHUSETTS CHARITABLE EYE AND EAR INFIRMARY, BOSTON.

By simple or peptic ulcer of the œsophagus is understood an ulcer situated in the lower part of the œsophagus and bearing a close resemblance to the simple ulcer of the stomach. It is a condition which has received little attention in this country, although not excessively rare, and it has, therefore, seemed worth while to report the following three cases, and to give a general discussion of the disease.

For the better comprehension of the subject it will be advisable, first, to consider briefly ulcerations due to other causes, which must be ruled out before the peptic nature of the lesion can be admitted. Of these, twelve forms may be distinguished: (1) carcinomatous, (2) due to the action of corrosive substances, (3) due to foreign bodies, (4) occurring in the course of acute infectious diseases, (5) decubitus, (6) due to aneurysm, (7) catarrhal, (8) due to traction diverticula, (9) tuberculous, (10) syphilitic, (11) varicose, (12) due to thrush. The first three forms are sufficiently well known to be dismissed without further consideration.

Ulcers of the œsophagus have been reported as postmortem findings in the following acute infectious diseases: dip¹theria, scarlatina, variola, typhoid fever, and pneumonia. They are due to acute inflammation, and bacteria are found present.

In diphtheria, Councilman, Mallory, and Pearce¹ found membrane in the œsophagus in twelve out of 220 autopsies, or 5 per cent. The lesions consisted of longitudinal erosions with sharply cut edges, and covered with adherent fibrinous membrane. Leube² states that stenosis may follow.

In scarlatina the process is a diffuse inflammation with ulceration, invading the œsophagus by extension from the pharynx; it may be followed by stenosis. The ulcers in variola arise from the breaking down of œsophageal pocks. Louis and others have called attention to ulcers in the œsophagus, occurring in typhoid fever, usually in the upper part, and accompanied by ulceration of the pharynx; the specific bacilli have not yet been demonstrated in them. They, too, may be followed by stenosis. Of lesions occurring in croupous pneumonia I have found but two instances: (1) a case of Kraus,³ in an elderly female; numerous hemorrhagic infiltrations in the lower half of œsophagus, hemorrhagic erosions, and

¹ A Study of the Bacteriology and Pathology of 220 Fatal Cases of Diphtheria, Boston, 1901.

² Specielle Diagnose der inneren Krankheiten, Band i. S. 262.

³ Die Erkrankungen der Speiseröhre, p. 193.

small ulcers near the pylorus; (2) a hitherto unpublished case from the Boston City Hospital: a man, aged fifty-four years, croupous pneumonia of the right upper and middle lobes; at the middle of the œsophagus on the posterior wall an irregular superficial ulcer, 2.5 x 6 cm., covered with diphtheritic membrane; microscopic examination showed a fibrinous membrane, with no Klebs-Loeffler bacilli. Cultures from the heart, lung, liver, and kidneys all showed the presence of pneumococci.

Decubitus of the œsophagus occurs on the anterior or posterior wall, or both, corresponding in size and situation to the posterior part of the cricoid cartilage, to the pressure of which it is due. It is seen after death from wasting diseases, especially typhoid fever and tuberculosis.

The ulceration which sometimes accompanies aneurysm of the descending aorta is probably likewise due to pressure; necrosis of the mucous membrane first takes place, followed by ulceration and perforation.¹

Catarrhal ulcers are rare; they are small and shallow, involving only the mucous membrane, with irregular edges; they are accompanied by catarrhal œsophagitis. The so-called follicular ulcers occupy the site of the mucous glands, and are small and cup-shaped.

Ulcers due to traction diverticula may show a superficial resemblance to peptic ulcers, but their situation, usually at the bifurcation of the trachea, and the presence of shrunken adherent lymph glands, reveal their true character.

Tuberculous ulcers of the œsophagus are very rare; they are usually shallow, with necrotic, purulent bases, resembling tuberculous ulcers of the mouth and pharynx. Tubercles may be found in the walls of the ulcer, and there is always tuberculosis of other organs.

Ulceration occasionally takes place in the mucous membrane over an œsophageal varix; the wall of the vein is soon perforated, and death takes place by hemorrhage before the ulcer attains a considerable size.

Ulceration from thrush is rare and occurs almost exclusively in infants.

From this brief account of the various ulcers to be met with in the œsophagus, I now pass to the consideration of the subject of this paper, peptic ulcer.

HISTORY. Ulcer of the œsophagus, resembling peptic ulcer of the stomach, was first described by Albers in 1839. From that time on, occasional cases were reported by Flower, Reeves, and others, and the existence of such ulcers was admitted by so great an authority as Rokitsky. Zenker, writing in 1878, and Birch-Hirschfeld, claimed that the ulcer in all these cases was

¹ Fr. Kraus. *Die Erkrankungen der Speiseröhre*, p. 178.

due to carcinoma, perforated traction diverticula, and other causes, and they denied the occurrence of peptic ulcer in the œsophagus. In the following year, however, Quinke published three cases in which the peptic nature of the ulcers seemed clearly proved, and a careful microscopic examination left no loop-hole for criticism. It is owing to him that the disease became established as a definite entity. Since then cases have been reported by a number of observers, of whom Chiari, Debove, Ortmann, and Kraus have added most to our knowledge of the subject. Excluding all cases before those of Quinke on the ground of uncertainty of diagnosis, there have been reported up to the present, forty-one cases of peptic ulcer of the œsophagus; of these, eight were without autopsy, but from the clinical picture the diagnosis seems reasonably certain. I have been able to collect three other cases, hitherto unpublished, one of which came under my personal observation; this makes a total of forty-four cases, on the analysis of which the following statements are based.

ETIOLOGY. The disease in question, though rare, is probably not so infrequent as might be supposed from the small number of cases reported. A study of the records of the Massachusetts General, Boston City, and Long Island Hospitals showed that peptic ulcers of the œsophagus were noted in six cases out of 4496 autopsies, *i. e.*, 0.13 per cent.

AGE. Ulcer of the œsophagus occurs from infancy to old age; the youngest reported patient being three days old, the oldest sixty-six years. It is met with most frequently in middle age, as the following table shows:

<i>Age.</i>	<i>Cases</i>
0 to 9	5
10 to 19	2
20 to 29	5
30 to 39	5
40 to 49	11
50 to 59	8
60 to 69	4
Total	40

In three cases it has been found as the source of the bleeding in hemorrhagic disease of the newborn.

SEX. Of forty cases in which the sex was specified, twenty-eight were males and twelve females; out of twelve cases with complicating ulcers in the stomach or duodenum, there were eleven males and but one female. A similar preponderance in favor of the male sex is found in duodenal ulcer, whereas ulcer of the stomach, as is well known, occurs more frequently among women. This may be due to the greater frequency of alcoholism among men, as Boas has suggested for duodenal ulcer.

PREVIOUS DISEASE. In order that peptic ulcer should be formed, it is evidently necessary that the cardia should be insufficient, allowing regurgitation of the gastric juice into the œsophagus. An important part is played in the etiology, therefore, by diseases accompanied by frequent vomiting, such as peritonitis, nephritis, chronic gastritis, and especially ulcer of the stomach or duodenum. In the disease last mentioned, besides the vomiting, two factors are of importance: (1) ulcer of the cardia with organic insufficiency; (2) stenosis at the pylorus, with dilatation of the stomach, which may involve the cardiac orifice, with consequent relative insufficiency. The importance of the second factor is shown by the presence of stenosis of the pylorus or duodenum in eight of the cases with autopsy, or 23 per cent.

In nephritis, besides the frequent vomiting, the deleterious action of the uræmic poison on the tissues is probably effective. Disease of the kidneys was found in four cases; it was probably present oftener, as in many instances the condition of the kidneys is not mentioned.

That peptic ulcer may result from mercurial poisoning seems probable from the following case occurring at the Massachusetts General Hospital (service of Dr. R. H. Fitz): Minnie P., female, aged thirty-seven years, entered the hospital November 26, 1901, with general œdema and advanced failure of compensation. There was a history of frequent vomiting lately. She received, for purposes of diuresis, 63 grains of calomel in seven days, combined with opium and digitalis. The stools became frequent and bloody, and there was hemorrhage from the gums also. Death took place December 5th. At the autopsy were found a dilated heart, with double lesions of the mitral and aortic valves; chronic passive hyperæmia of the kidneys, lungs, liver, and spleen, and severe diphtheritic colitis; in the lower part of the œsophagus were four or five shallow ulcers involving the mucous membrane only, with reddish, finely granular bases, and irregular outlines, the largest 12 mm. in diameter; the surrounding mucous membrane was healthy; the stomach was normal. No microscopic examination of the ulcers was made. The lesions in the intestine corresponded with those found in acute mercurial poisoning.

In this case it must be admitted that it is possible the ulcers were due to the action of mercury, either alone or combined with passive hyperæmia. In view, however, of the situation in the lower part of the œsophagus, and of the opportunity offered for the action of the gastric juice by the frequent vomiting, it seems reasonable to assume that the mercury acted merely as a predisposing cause, and that the ulcers were peptic.

Chlorosis, which has been supposed to favor the development of ulcer in the stomach, probably plays no part in the production of œsophageal ulcer, for it was not present in any of the cases.

OTHER FACTORS. The abuse of alcohol deserves mention among the predisposing causes, occurring with considerable frequency. Alcohol probably acts in two ways: first, by irritation of the Œsophagus, and second, by the production of gastritis, with vomiting and insufficiency of the cardia.

Various lesions of the heart and vessels have been found present, and may be of some importance in etiology, through disturbance of nutrition in the Œsophagus. Among them arteriosclerosis, aortic aneurysm, hypoplasia of the aorta, and myocardial degeneration may be mentioned. In a case of Carstens with amyloid disease, it is uncertain whether the diseased condition of the vessels or the accompanying nephritis was effective.

The possibility of a traumatic origin must be considered next. Ortmann has reported cases in which the first symptom came on after swallowing food of an irritating nature, *e. g.*, sour wine, and in which he assumed that spasm of the Œsophagus took place, producing a tear in the wall, which became a starting point for the ulcer. It is possible, however, that the ulcer already existed in a latent form, and the question cannot be considered settled.

The relation of the acidity of the gastric juice to ulcer is an interesting one, but unfortunately the point was noted in only seven instances. Of these, four were complicated with ulcer of the stomach (or duodenum); free HCl was "present" or increased in three, diminished in one case. In the three cases in which the ulcer was in the Œsophagus alone, HCl was "present" in two cases, increased in one. The figures are too few for any deductions, but one would expect hyperacidity to be the rule, as in gastric ulcer.

Large abdominal tumors were present in three cases, in one of which there was also cancerous peritonitis. Quinke expressed the opinion that here, by the pushing up of the diaphragm, a kinking of the Œsophagus was produced, which in turn caused circulatory disturbances favorable to ulcer formation. Acute and chronic peritonitis, each noted in two instances, might be efficacious in two ways, by causing vomiting, and by pressure on the diaphragm (meteorism).

Fischer¹ has reported ulceration of the Œsophagus after extensive burns, analogous to ulcer of the duodenum under like circumstances. Probably thrombosis or embolism is the primary event here, due to disintegration of the red cells of the blood, or possibly to septic processes.

It remains to discuss the possibility of a nervous origin for the ulcer. Guit  ras has reported the following case, which he considered to be peptic ulcer due to hysterical ischaemia and merycism: A woman, aged forty-four years; had nervous prostration nine years

¹ Quoted by Huwald, p. 21. (See bibliography.)

before; two years later, difficulty with swallowing, especially with liquids; globus hystericus. Eighteen months before entrance to the hospital a similar attack, but more severe, was cured temporarily by the passage of bougies. Return of symptoms, with complete inability to swallow; emaciation and death. At autopsy the œsophagus, from a point four and one-half inches below the cricoid to the cardia, was riddled with ulcers, pin-head to pea-sized, for the most part superficial; opposite the bifurcation of the trachea were two larger ulcers, which had perforated into the mediastinum; numerous pigmented scars, apparently of healed ulcers, were also present.

The earlier symptoms in this case point clearly to nervous spasm of the œsophagus, and in this condition it is known that secondary dilatation may take place, with stagnation of food in the œsophagus. In a few of these cases¹ numerous thickly set ulcers have been found, very similar to those described by Guitéras. In view of these facts, the peptic character of the ulcers in his case seems very doubtful, and I have, therefore, not included it in this series.

There are no other cases in the literature which point to a nervous origin of œsophageal ulcer, and from what we know of gastric ulcer such an origin does not seem probable.

PATHOLOGY. Simple ulcer of the œsophagus resembles very closely, both in gross and microscopic appearances, simple ulcer of the stomach. It is situated, as a rule, in the lowest part, close to the cardia, as one would expect from the peptic origin. Usually it stops short at the cardia; in six cases, however, or 17 per cent. of the thirty-six cases which came to autopsy, it involved the adjacent part of the stomach also, and the appearance of the ulcer pointed to a primary seat in the cardia, with invasion of the œsophagus by direct extension. It may reach as high as the bifurcation of the trachea, but single ulcers situated at this level (as in Part's case²) are to be viewed with suspicion, as it is not likely that the gastric juice would exert its action at such a distance from the stomach. Of the seven cases in which definite statements are made as to the situation, the ulcer was in the anterior wall twice, in the posterior wall three times, on the left side twice, and three times on the right; the right posterolateral wall seems, therefore, to be the seat of predilection. The size varies greatly, from that of a pea or smaller to ulcers involving the entire surface from the cardia to the bifurcation. In most of the cases (81 per cent.) but a single ulcer is present; in others they are very numerous. It is probable that some of the large, irregular ulcers arise by confluence. The smaller ulcers are mostly round or oval, the larger are irregular, often girdling. If very recent, the loss of substance is slight, involving only the mucous membrane, usually irregular in outline,

¹ See A. Neumann, *Centralbl. f. d. Grenzgebiete d. Med. u. Chir.*, iii., 253; and A. Schmidt, *Münch. med. Woch.*, 1899, p. 304.

² *Lancet*, 1857, p. 167.

with clear cut edges and red, granular base. Older ulcers usually lay bare the muscular coat, and may show the typical pinched-out appearance and funnel-shaped base of the gastric ulcer; if of long standing, the base is smooth and the edges may be undermined. The surrounding mucous membrane is healthy as a rule; there may be dilatation of the lower oesophagus, even when no stenosis is present.

The ulcer, like its namesake in the stomach, has a strong tendency to perforation, which took place in six cases: twice into the right pleural cavity, once into both, with double pneumothorax, and once each into the aorta, pericardium, and lesser omental cavity. In Janeway's case, without actual perforation, there was inflammation of the periesophageal tissue, pericarditis, and pleurisy.

Microscopically, there are found the usual appearances of chronic inflammatory tissue, with the absence, of course, of evidence of cancer, tuberculosis, etc. In two cases, thrombosed arteries were found in the base. In Fraenkel's case, Stoerk found at the edge of the ulcer glands identical with those found in the stomach; Schaffer¹ and others have noted the presence of such glands in the normal oesophagus; there were similar findings in my first case. Kraus, however, sought them in vain in three instances.

Healing takes place frequently, with the production of a scar. Scars were found, either alone or in conjunction with fresh ulcers, in nine cases, or 25 per cent. They may be puckered and radiating, as in the stomach. If small, they do no harm; the larger ones by contraction produce stenosis. In one case (Ortmann) a carcinoma of the oesophagus was found developing from the scar of an old peptic ulcer; I have seen the specimen from a similar case, at the Pathological Institute in Vienna.

The cases of peptic ulcer may be divided into three groups: (1) those in which the oesophagus alone is involved; (2) these showing extension from the cardia; and (3) those with ulcers in other parts of the stomach or in the duodenum. The first group is much the largest, with twenty-two cases, or 61 per cent. of the cases with autopsy. The second comprises six cases (17 per cent.) and the third twelve cases (33 per cent.). The last two groups cannot be sharply separated, because in several instances both the cardia and other regions of the stomach were involved. The distribution of the ulcers in the third group was as follows: anterior wall, one case; posterior wall, one case; pylorus, five cases; duodenum, five cases. Stenosis of the pylorus and of the duodenum, with dilatation of the stomach, were each present four times. In the case of Kraus, besides stenosis of the duodenum, there was an hour-glass stomach. In three instances death was due to the perforation of a gastric ulcer.

¹ Beiträge zur Histologie menschlichen Organe, Sitzungsberichte der Wiener Akademie, October, 1897, Band. cvi., 3 Abth.

Hemorrhagic infiltration of the œsophagus, with numerous erosions in the stomach, was reported by Kraus in a case of pneumonia. From the resemblance of the lesions to those seen in the stomach in certain cases of septicæmia, an infectious origin seems probable, and I have, therefore, classified it among the ulcers of acute infectious diseases.

Ulceration of the œsophagus in hemorrhagic disease of the newborn demands a separate consideration. There are three such cases in the literature. The first (Henoch) showed a deep ring-shaped ulcer, 2 cm. long, just above the cardia, with gray-white, infiltrated base; the throat was normal (no diphtheria). In Spiegelberg's case there was a pea-sized area of hemorrhagic infiltration at the junction of the cardia and the œsophagus, with superficial necrosis; microscopic examination showed no lesion of the vessels; blood-cultures during life were sterile. In the third case (Meyer) the lesion consisted of an ulcer immediately above the cardia, with an elongated thrombus measuring 6 x 7 x 12 mm., tightly adherent. Microscopic examination showed inflammatory infiltration of the base and edges of the ulcer, with streptococci and long bacilli in these tissues, and also in the circular muscular coat; sections of the liver, spleen, and kidneys showed no bacteria; no cultures were made. The stomach and intestines were normal in all.

The presence of bacteria in the tissues in the last case, and of hemorrhagic infiltration in the second, are strongly suggestive of a bacterial origin, a view that is often taken nowadays of hemorrhagic disease of the newborn in general. The lesions just described resemble those found in the stomach and duodenum in a few other cases of this disease. The sequence would appear to be hemorrhagic infiltration (due to capillary embolism), necrosis, then digestion by the action of the gastric juice, with ulceration.

LESIONS IN OTHER ORGANS. Of these the most interesting are the abdominal tumors, which were present as the primary disease in three cases; curiously enough, they all arose from the ovary. Whether this is anything more than a coincidence must be left to the future to decide. The nature of the growth was as follows: carcinoma of the ovary with cancerous peritonitis (Quincke), enormous cyst (Quincke), fibroma the size of a man's head (Sabel).

Chronic interstitial nephritis was noted in four cases, in one of these combined with amyloidosis of the liver and spleen. Tuberculous peritonitis and acute general peritonitis were each present twice; the latter was due to perforation of a gastric ulcer and of the gall-bladder respectively. Cirrhosis of the liver and phthisis were each present in two cases. In the case of Dasse, there was an aneurysm of the aorta, the size of a hen's egg, adherent to the œsophagus. The aneurysm was situated at the fourth dorsal vertebra, the ulcer 4 cm. above the cardia; the distance between the two renders any direct causal relationship doubtful.

PATHOLOGICAL DIAGNOSIS. This may be summed up as follows: an ulcer in the œsophagus is to be regarded as peptic when it presents the appearances already described, is situated in the lower part of the œsophagus, and none of the other causes of ulceration are present. The finding of similar ulcers in the stomach or duodenum strengthens the diagnosis.

PATHOGENESIS. As already mentioned, the first requisite for the formation of the peptic ulcer of the œsophagus is an insufficiency of the cardia. This may be organic in the cases in which the ulceration is at the cardia; in the rest it is functional. Normally the cardia is closed, owing to the tonic contraction of the circular fibres. Relaxation takes place through inhibitory impulses from the vagus fibres, and occurs with the act of swallowing, and with pyrosis, belching, and vomiting. Another source of insufficiency is a decrease in tone of the cardiac sphincter, similar to that which occasionally takes place at the pylorus. In this connection, it should be mentioned that a rhythmical relaxation of the cardia has been observed in some animals during digestion, with regurgitation of food into the œsophagus.

Evidently insufficiency must occur frequently without producing ulcer; for the formation of an ulcer something else must be added. It is generally admitted for gastric ulcer, that the first step is a necrosis of the mucous membrane, which then becomes digested away by the action of the gastric juice, with resulting ulcer formation. But why the necrosis takes place has never been satisfactorily explained. The prevailing theory is that it is due to circulatory disturbances of one sort or another. Infectious thrombosis has been assumed as a cause, and probably holds good in some cases of hemorrhagic erosion, but has not been shown to occur in peptic ulcer. Thrombosis of an artery in the base of the ulcer has been demonstrated in two cases (Zahn and first case of Tileston), but was probably secondary in the first, and certainly in the second, in which there was also erosion of the arterial wall. Quincke's theory of kinking of the œsophagus, owing to upward pressure on the diaphragm, would account for only a limited number of cases. That hyperacidity of the gastric juice plays a part in preventing healing of the ulcer seems probable, but the data on this point are insufficient for definite conclusions. In short, the real cause of peptic ulcer of the œsophagus, as is the case with gastric ulcer, remains hidden.

Before passing to the description of the clinical picture, I have to report three new cases, which possess several interesting features.

CASE I. From the service of Dr. J. J. Minot, Long Island Hospital, Boston.

Catherine C., aged fifty-eight years, widow, was admitted on March 23, 1905, in a moribund condition, and died one hour afterward. No physical examination was made. The history obtained

from a friend later was unsatisfactory. Fifteen years ago amputation of the left leg was performed; cause not ascertained. Eight years ago she was in a hospital with "heart trouble." Cough and dyspnoea for several days previous to admission; no symptoms referable to the œsophagus.

Autopsy: Ninety-one hours postmortem. Dr. G. B. Magrath

Anatomical Diagnosis: Chronic adhesive pleuritis; hydropneumothorax; atelectasis; acute vegetative endocarditis (mitral); fatty infiltration of the myocardium; ulcer of the œsophagus with perforation into the pleural cavity; chronic perisplenitis; fatty metamorphosis of the liver; chronic nephritis; hemorrhagic infarction of the kidneys; hemorrhagic pachymeningitis; general arteriosclerosis (slight).

Body that of a woman, aged fifty-eight years; length 142 cm.; well-developed and nourished. On the trunk and inner aspect of the thighs a brown, macular, and somewhat diffuse pigmentation, emphasized over the abdomen and at the axillæ; the skin of the right lower leg and ankle shows faint, whitish, irregular scars.

Subcutaneous fat 3 cm. in thickness; muscles fairly well developed, rather fatty. Chest wall prominent and convex; height of diaphragm, sixth rib on right side, fifth rib on left. Puncture of the wall of the right chest is followed by the escape of numerous bubbles of air or other gas.

Pleural Cavities: Left: interrupted by rather numerous dense fibrous bands, and contains 500 c.c. of clear serous fluid; right: contains 1300 c.c. of yellowish, somewhat turbid fluid, with strings of fibrin; a few fibrous adhesions at the apex and base; the inner wall, just above the diaphragm, presents an elliptical opening, 3 x 6 cm., apparently communicating with the œsophagus, and with edges slightly rounded; the adjoining pleural surface a little roughened.

Œsophagus: On the right lateral and posterior walls, at a level 2 cm. above the opening into the stomach, an irregularly oval ulcer, its vertical axis 3.5 cm., the transverse 2 cm.; the edges are rounded, somewhat inverted, and perfectly smooth; the floor is somewhat uneven, gray, mottled with yellow, and fairly firm; the depth is about 1 cm.; the edges are extensively undermined, and the left border a good deal indurated; in the deepest part of the ulcer is the opening into the pleural cavity, already described. The neighboring lymph nodes and those along the lesser curvature of the stomach are of the size of beans, upon section, extensively pigmented but otherwise negative.

Pericardial Cavity: Normal.

Heart: Weight, 305 grams; epicardial fat fairly abundant; on the epicardium of the right ventricle fairly numerous punctate hemorrhages; myocardium pale brown-red, and rather limp; that of the right ventricle shows some invasion of the epicardial fat. Wall of left ventricle 1.3 cm., of right 0.3 cm. in thickness. Mitral

valve 10, aortic 7, pulmonary 7, tricuspid 11 cm. in circumference. Depth of left ventricle 9 cm. Cavities of both ventricles a little dilated. Both curtains of the mitral valve show nodular vegetations along the line of apposition, grayish, translucent, and granular, and about 0.4 cm. in elevation; on the anterior curtain there is also a "cauliflower" excrescence. The right posterior cusp of the aortic valve shows a calcareous nodule at its base. Pulmonary and tricuspid valves normal. Coronary arteries fairly smooth.

Lungs: Left: moderately crepitant throughout; slight scarring at the apex; the lobes interadherent; upon section, gray-red, under pressure yielding a little frothy fluid; bronchial lymph nodes black. Right: of diminished volume; lies back in the pleural cavity close against the inner wall; slaty gray; the pleural surface for the most part smooth, with here and there an attached fibrous tag and shred of fibrin; the upper and middle lobes interadherent, the apex without scars; the upper lobe somewhat crepitant and downy; the lower lobe flaccid and non-crepitant; careful inspection reveals no opening upon the pleural surface, or in the walls of the primary bronchi; upon section, similar to the left lung.

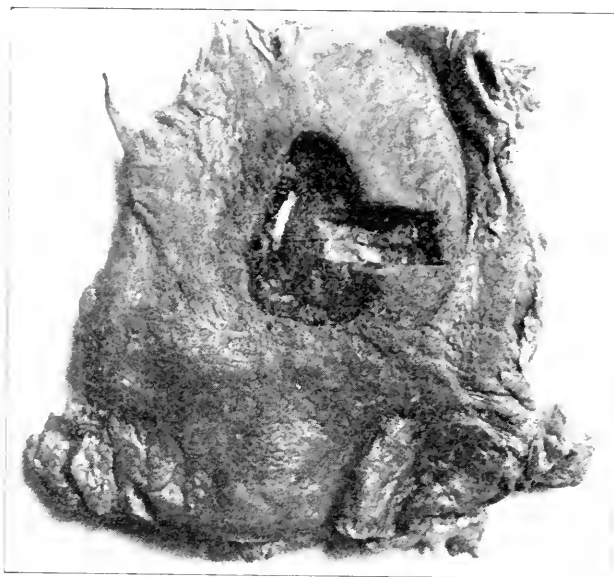
Abdomen: Peritoneal cavity interrupted by fibrous adhesions, uniting the spleen and the surrounding structures, and by others in the region of the foramen of Winslow. Spleen: weight 120 grams; bound down by adhesions, extensively fragmented upon removal; garnet red; markings indistinct; pulp seemingly increased. Stomach normal. Intestines: the ileum in its upper portion shows moderate injection of the veins and is of a general pale brick-red color; upon section, containing thin, semifluid material of the same color; colon empty. Vermiform appendix normal. Liver: weight 1200 grams; extensively dislocated downward; the surface in general smooth; general color pale brown; upon section, lobular markings distinct; the centres brown and a little depressed, the borders pale brown; consistence friable. Kidneys: weight of both 210 grams; capsule somewhat adherent to a surface marked by numerous shallow, in some instances, fairly deep scars, often linear, and giving to the organ a lobulated appearance; general color grayish-red; left: upon its posterior border, about midway between the poles, presents a cyst, 4 cm. in diameter; right: upon section, shows within the cortex here and there small dark-red splotches, 2 to 3 mm. across; cortex 0.5 cm. in average thickness; reddish-brown; glomeruli visible; consistence increased. Genitalia: uterus negative; appendages show senile atrophy. Aorta shows an inner surface mainly smooth, with a few slightly elevated non-calcified patches of yellowish thickening in the abdominal segment and in the arch. Gall-bladder, pancreas, adrenal glands, and bladder not remarkable.

Cranium: Sinuses normal; the dura of the right occipitoparietal region upon its inner aspect presents rather numerous, irregular,

slightly elevated, dark-red areas, for the most part 1 cm. across, to some extent, confluent; the overlying inner surface smooth. Brain: vessels of the base for the most part normal; the internal carotid arteries at the turn showing a little thickening; upon section, negative; the subdural space contains a little more than a normal amount of fluid. Spinal cord not examined.

Histological Examination. Oesophagus, ulcer: section of a segment through the left side of the ulcer, including the floor to its centre: at the free edge of the ulcer there are villi devoid of epithelium; here the submucosa contains a rather large number of widely dispersed plasma and lymphoid cells; the villi of the glands at the turn of the edge are lost in a zone of necrosis, about 0.5 mm.

FIG. 1



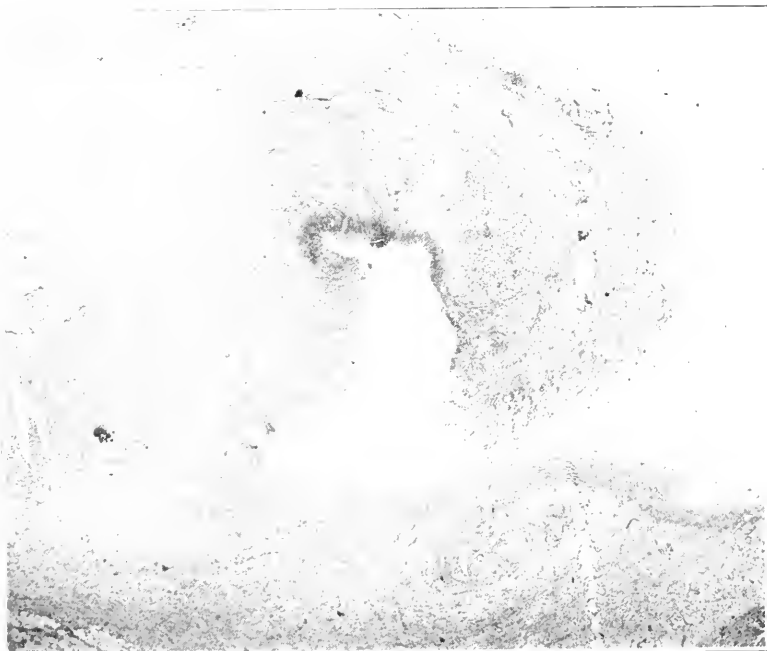
Gross appearances of the ulcer of the oesophagus ($\frac{1}{2}$ natural size), showing the perforation.

in breadth, which extends along the entire surface of the ulcer; the loss of substance involves the muscle coats and the connective tissue beneath them; outside of the zone of necrosis the tissues contain fairly numerous lymphoid and plasma cells, with occasional leukocytes and young connective-tissue cells, and in places newly formed bloodvessels. At several points small arteries lead into the surface of the ulcer, and one of them presents erosion of its wall upon the side toward the ulcer and is partially occluded by a thrombus which is continuous with the floor of the ulcer. Beneath the surface of the deepest part of the ulcer is fat tissue which has been largely replaced by a rather loose-meshed connective tissue, containing large, sometimes stellate cells in a fibrillar stroma; here and there,

particularly around the bloodvessels, are groups of lymphoid and plasma cells. Near the edge of the ulcer, in the submucosa, is a large group of glands with columnar epithelium, resembling mucous glands in structure.

A section of the oesophagus a short distance above the level of the ulcer shows the following appearances: muscular coats normal; epithelial layer absent (postmortem change); the mucous surface is represented by villous-like stalks of connective tissue. In the submucosa are cross-sections of several ducts.

FIG. 2



Microscopic section of the ulcer of the oesophagus, showing the overhanging edge.

Kidney: There are many small, irregular areas of slight connective tissue-increase, and numerous masses of connective tissue extending inward from the capsule, like trabeculae. In these regions there are many atrophied tubules and sclerosed glomeruli. In some there is abundant infiltration, with lymphoid and plasma cells. There is slight endarteritis and moderate perivascular increase of connective tissue. Many Henle and collecting tubules are filled with hyaline material. Histological diagnosis: chronic interstitial nephritis.

The accompanying illustrations (Figs. 1 and 2) give a good idea of the gross and microscopic appearances of the ulcer. The photomicrograph is by L. S. Brown, of the Clinico-Pathological Laboratory of the Massachusetts General Hospital.

In this case the typical appearance of the ulcer and the situation make the diagnosis of peptic ulcer certain. That the perforation took place during life is shown by the existence of acute inflammation of the pleura of the corresponding side. Interesting features are the apparent latency up to the time of perforation, the presence of chronic nephritis, and the close resemblance of the mucous membrane about the ulcer to that normally found in the stomach.

CASE II.—George R., a calman, aged fifty-nine years, was sent to the Massachusetts General Hospital (service of Dr. W. L. Richardson), on June 15, 1902, by Dr. Roscoe E. Brown, to whom I am indebted for the history. The patient had been failing for some months, suffering from retention of urine due to stricture of the urethra. His digestion was upset, and for a few weeks previous to entrance to the hospital he had difficulty in swallowing solid food; during the last two days he could take nothing but liquids. There was a good deal of pain and vomiting. The patient on entrance was semicomatose, delirious, and apparently in great pain. From time to time he vomited a thin fluid tinged with blood. Death took place in coma fifteen hours afterward.

Autopsy, twenty-two and one-half hours postmortem. Dr. J. H. Wright.

Anatomical Diagnosis: Chronic interstitial nephritis; extensive ulceration of oesophagus; chronic interstitial orchitis; focal tuberculosis of the left kidney; slight arteriosclerosis of the aorta.

The lower end of the oesophagus for a distance of 11 cm. is denuded of mucous membrane, except for a few small islands, and of a dirty brown-yellow color. The ulceration is very shallow, not involving the muscularis. The bordering mucous membrane has smooth edges, and is not discolored. At the upper margin the loss of substance is continued upward in the form of two irregular streaks; the longest is 5 cm. No microscopic examination was made. The mucous membrane of the stomach of a dirty slate color.

Kidneys: left, 36 grams; right, 97 grams. Capsule adherent; cortex very narrow; normal markings absent. In the left, several sharply defined, opaque, firm, yellowish masses, the largest 3 mm. in diameter.

In this case the ulceration is more acute in character than in the preceding, and probably extended rapidly during the last few days, when the patient was in the uræmic state. In spite of the lack of microscopic examination there can be no doubt of the diagnosis.

CASE III.—Martha H., aged twenty-seven years, widow. Admitted to the Massachusetts General Hospital, April 30, 1898 (service of Dr. F. C. Shattuck). One year before, stomach trouble with anæmia. For two weeks, gastric pain, vomiting, and prostration. This morning taken suddenly with severe abdominal pain. An immediate operation (Dr. F. G. Balch) revealed general

peritonitis, but no perforation could be found. Death took place the next day.

Autopsy, three and one-half hours postmortem. Dr. J. H. Wright.

Anatomical Diagnosis: Ulcus ventriculi with perforation; general acute fibrinopurulent peritonitis; slight ulceration in the œsophagus; obsolete tuberculosis of mesenteric glands; œdema of pia; laparotomy wound.

Peritoneal cavity full of yellow, cloudy fluid containing flocculi. Stomach adherent to left lobe of liver. Ulcer in anterior wall of stomach, midway between pylorus and cardia, presenting irregular perforation 1 cm. in diameter, with smooth edges. This opening leads to an abscess cavity the size of a bean, between the stomach and liver, surrounded by chronic inflammatory tissue. No evidence of cancer about the ulcer.

Œsophagus: In the œsophagus, several losses of substance; ulcers shallow, with ill-defined edges and rather dark-red, granular bases. Microscopic examination of œsophagus: in places the epithelium absent, exposing the submucosa or membrana propria, in which there is a marked infiltration with plasma cells.

In this case, therefore, we see a chronic ulcer of the stomach with perforation, resulting in localized, and later general peritonitis. The œsophageal ulcers are of very recent date, judging from their superficial character and fresh granulations. They probably occurred some time after the first perforation of the ulcer of the stomach. The infiltration with plasma cells shows that the process took place during life.

I now return to the general discussion of the disease and pass to the clinical aspect.

SYMPTOMS. In a large proportion of the cases the ulcer has not been suspected during life, being either entirely latent, or giving rise to no symptoms sufficiently characteristic for a diagnosis. In another group, it has remained latent up to the time of perforation. The symptoms vary in different stages of the disease according as the ulcer is open or healed. The most prominent manifestations of the stage of ulceration are five, namely, pain, dysphagia, vomiting, hæmatemesis, and perforation. Owing to their importance it will be best to consider each in detail. The cases in the newborn are not included in this discussion. The only symptoms they present are hæmatemesis and melæna.

Pain: This is the most constant symptom. Out of thirty-four cases in which the history is given it was present in 82 per cent. The pain was of such a character as to suggest an origin in the œsophagus in 60 per cent. of those cases in which it was accurately described. The characteristic location is at the xiphoid cartilage, or beneath the sternum, radiating to the back between the shoulder-blades. In some cases it was referred by the patient directly to

the lower end of the œsophagus, in others, to the front of the chest. In a few instances the pain was epigastric, although the ulcer was situated in the œsophagus only. Tenderness to pressure has been observed in the epigastrium and over the lower sternum; no mention is made of tender points in the back analogous to those frequently found in gastric ulcer.

The relation to food is important. As a rule, the pain occurs either during the last part of the act of swallowing or immediately afterward, in contrast to the later onset of pain in gastric ulcer. It varies from a slight burning sensation to a pain so severe as to prevent the patient from eating, and to require morphine. It is usually paroxysmal, with intervals of partial or complete relief. The passage of bougies may cause great pain.

Dysphagia: Difficulty in swallowing was present in 52 per cent. of the cases. In the early stage the method of production is as follows: the food in passing over the surface of the ulcer causes pain, which in turn by reflex action causes spasm of the œsophagus, to which the dysphagia is due. At first the patient merely experiences an obstruction at a certain point, which is soon overcome, and the food enters the stomach; later, however, the spasm is so severe that regurgitation takes place. The dysphagia and obstruction to the passage of sounds may be intermittent, probably owing to variations in the amount of spasm. In a case of Quincke, of ulcer involving both cardia and œsophagus, there was a pouch formed in the wall of the latter, which when filled with food, or entered by the sound, acted as a valve, obstructing the lumen; vomiting, however, was always possible.

Vomiting: This symptom was noted in 71 per cent. of the cases. In some cases it is due to complicating lesions in the stomach, such as ulcer, chronic gastritis, pyloric stenosis; in others it is apparently reflex, and due to the pain occasioned by the passage of food. The vomiting in some cases is of rare occurrence in others, almost incessant. It takes place usually soon after meals.

Hemorrhage: This was observed during life in eighteen cases, or 53 per cent. of the cases with a clinical history. In two others the stomach was found full of blood at autopsy, death occurring before hæmatemesis could take place. In seventeen cases the blood was vomited, in one bloody stools alone are mentioned. There were both hæmatemesis and melæna in seven cases. The blood when vomited, as a rule, presents the familiar "coffee-grounds" appearance; if the hemorrhage is profuse, however, and vomiting occurs early, it may be still a bright red. The source of the hemorrhage is found to be erosion of an artery in the base of the ulcer; in one instance (Eversmann) the aorta itself was perforated. The hemorrhage is usually repeated, and frequently profuse, causing severe anæmia. In the case of Zahn the red count fell to 950,000 and a diagnosis of pernicious anæmia was made. There is no criterion

by which one can tell, from the appearance of the blood, whether it comes from an ulcer in the œsophagus or in the stomach. Curschmann,¹ however, has noted that in hemorrhage from a ruptured œsophageal varix the blood usually gushes out without the nausea and straining which accompany gastric hemorrhage. It seems probable that this form of hæmatemesis, when accompanied by signs of ulcer, would point to the œsophagus as the origin rather than to the stomach.

Perforation: This ominous event was of quite frequent occurrence, being noted in six cases, or 14 per cent. of the total number. It was generally fatal. With perforation into the pleural cavity the patient is suddenly seized with intense pain in the chest, dyspnoea, and collapse, with the signs of pneumothorax or hydro-pneumothorax. The symptoms differ from those of the so-called spontaneous rupture of the œsophagus, in that subcutaneous emphysema is absent. Perforation below the diaphragm gave rise to circumscribed peritonitis of the lesser omental cavity.

Other symptoms mentioned are: dyspepsia, with anorexia, nausea, belching, pyrosis, inanition, constipation, and increased thirst.

SYMPTOMS OF THE SECOND STAGE. In those cases in which the ulceration has not been extensive this stage is not accompanied by symptoms; usually, however, the evidences of a benign stenosis of the œsophagus are present. There is a gradual onset of inability to swallow, involving first solid and then fluid food, and regurgitation takes place, at first immediately, and later, when dilatation has occurred, a considerable time after eating. With the stomach tube as much as a litre may be removed from the dilated œsophagus; that it does not come from the stomach is shown by its alkaline or neutral reaction, with absence of HCl and ferments; milk is returned uncurdled. On passing a sound an obstacle is encountered which may be impassable except for the smallest calibres.

COURSE OF THE DISEASE. The onset is usually gradual, beginning with pain and dysphagia; frequently dyspepsia or the symptoms of gastric ulcer precede. In other cases the ulcer remains latent up to the occurrence of hemorrhage or perforation; when ulceration takes place as a terminal event in other diseases there may be no symptoms pointing to the œsophagus. The course is often remittent, periods of comparatively good health alternating with attacks of pain, vomiting, and hæmatemesis. The duration, including the stage of stenosis, varies from a few days up to twelve years; in 63 per cent. it was under six months. Death took place most frequently from perforation or hemorrhage; other causes were inanition, perforation of other organs (stomach, gall-bladder), and chronic wasting diseases.

DIAGNOSIS. The diagnosis of peptic ulcer of the œsophagus is difficult, and in many cases impossible; in others it may be made

¹ Deutsche med. Woch., April 17, 1902.

with a considerable degree of certainty. Peptic ulcer should be suspected in all cases with symptoms pointing to ulceration in the lower part of the œsophagus. The diagnosis is practically certain, if other causes of ulceration can be excluded, and there are dysphagia, pain during or soon after deglutition, situated under the sternum or between the shoulder-blades, hæmatemesis or melæna, and obstruction in the lower part of the œsophagus. Symptoms of present or past ulcer of the stomach or duodenum are very strong confirmatory evidence. Tenderness over the lower part of the sternum, and perhaps, also, behind near the ninth dorsal vertebra, should be looked for. Up to the present the œsophageal appearances have been recorded in but a single case, that of Starck.¹ He saw in the left anterior quadrant, 38 cm. from the teeth, a whitish ulcer with infiltrated edges and dirty, dark-red base. When touched, it bled readily, and was very painful. He made the diagnosis of carcinoma, but the complete recovery showed that he had to do with peptic ulcer. It seems probable that in the future the œsophagoscopic diagnosis will be possible for the expert, supplemented, if necessary, by excision of a piece of tissue for microscopic examination. The detection of hemorrhage may be aided by the use of the guaiac test for blood in the stools. Great care should be used in the passage of sounds, owing to the danger of hemorrhage.

DIFFERENTIAL DIAGNOSIS. Peptic ulcer of the œsophagus is to be distinguished from ulcer of the stomach or duodenum, and from ulcers of the œsophagus due to other causes.

From ulcer of the stomach it differs in the presence of dysphagia and in the character of the pain, which in gastric ulcer occurs at a later period after eating, and is referred to the epigastrium and lowest dorsal region, but not to the chest. Tenderness over the sternum points to the œsophageal origin; epigastric tenderness is equivocal. Ulcer at the cardia gives rise to the same symptoms as ulcer in the lowest part of the œsophagus, and cannot be distinguished from it.

Passing to the consideration of ulcers of the œsophagus which are not peptic, those occurring in the course of acute infectious diseases heal promptly, and, therefore, are not likely to cause confusion. The decubitus of the œsophagus may be seen with the laryngoscope at the level of the cricoid. Varicose ulcers are rapidly fatal from hemorrhage; they are to be distinguished from peptic ulcer by the lack of previous pain and dysphagia; the presence of signs of cirrhosis of the liver points toward a varicose origin of the hemorrhage, but is not conclusive, as two cases of peptic ulcer have been complicated with cirrhosis. The other forms of ulcer usually lead to fibrous stenosis, and will be considered later.

Stenosis following peptic ulcer is to be distinguished from the following conditions: (1) Obstruction due to compression of the

¹ See bibliography.

œsophagus from without; (2) stenosis due to causes other than peptic ulcer; (3) other diseases of the œsophagus accompanied by symptoms of obstruction.

Among the causes of compression of the œsophagus from without, the most important are aneurysm, mediastinal tumors, and cold abscesses secondary to tuberculosis of the spine. Dysphagia, usually remittent, has been met with as a rare symptom in aneurysm of the transverse arch, and of the descending aorta; perforation into the œsophagus, an unusual accident, may be preceded by marked pain on swallowing, due to ulceration of the mucous membrane. The usual signs of aneurysm, and particularly the use of the *x*-rays, will make the recognition of such cases possible. Mediastinal tumors and cold abscesses, as sources of pressure, will usually become evident on a careful examination of the chest and spine.

True stenosis of the œsophagus may be divided into two classes, malignant and benign. Of these the former is by far the more common and important. On this account, and because several of the cases of peptic ulcer have been mistaken for cancer, it will be well to go somewhat in detail into the differential diagnosis between the two. The onset in cancer is more insidious, and the course of the obstruction more progressive, without such marked intermissions as are seen in ulcer, except in those rare cases in which the passage becomes open again after the sloughing away of part of the growth. The duration is short in cancer, usually not above six months after the appearance of marked symptoms, whereas the stenosis of ulcer may last for years. In cancer the hemorrhage is smaller in amount, consisting of a little blood mixed with food or mucus; exceptionally, however, one of the large vessels may be opened, in which case death soon takes place. The pain is somewhat similar to that of ulcer, but may occur at night, and independently of the taking of food. The situation is of importance, inasmuch as the stenosis due to ulcer almost never occurs so high as the bifurcation of the trachea, the favorite seat of cancer. A high obstruction, therefore, rules out ulcer, a low one may be due to either disease. Cachexia without obstruction for liquid as well as solid food speaks for cancer (Kraus).

Further points of importance in cancer are the presence of enlarged glands in the neck, and of pressure symptoms, especially paralysis of the recurrent laryngeal nerve. These do not occur in ulcer. The examination of the stomach contents is of little assistance, as anacidity may occur with either form of stricture. Pathognomonic for cancer are the findings with the œsophagoscope, and the microscopic appearance of fragments of the growth that may be withdrawn with the sound.

Stricture due to the action of corrosive poisons is readily distinguished by the history, and the presence, at times, of scars in the mouth or pharynx. The rare strictures following typhoid fever, scarlatina, and diphtheria come on during convalescence, and, there-

fore, are not likely to lead to error. Tuberculous and syphilitic strictures are extremely rare and are not preceded by such marked pain and hemorrhage as occur in peptic ulcer. The syphilitic variety is to be distinguished from peptic ulcer by its high situation near the pharynx, the presence of tertiary lesions elsewhere, and by the improvement under specific treatment, if instituted early.

Stenosis following the ulceration due to foreign bodies is to be distinguished by the history; the presence of the foreign body may sometimes be detected by the sensation imparted on touching it with a stiff sound or by the use of the x-rays.

The œsophageal diseases likely to be confused with stenosis are nervous spasm, diffuse dilatation, and pulsion diverticulum. The first is usually situated at the cardia, but differs from the stenosis due to ulcer in the following points: solid food is often swallowed more readily than liquids, hemorrhage is lacking, and the obstruction, which can always be overcome by pressure, may disappear after a single passage of the sound. Signs of neurasthenia or hysteria are almost invariably present.

Diffuse dilatation which occurs as a result of cardiospasm, or of atony of the musculature of the œsophagus, may simulate stricture closely. It is recognized by the freedom with which the sound may be moved about in the œsophagus, the withdrawal from the latter of stagnating contents, in which no gastric ferments or hydrochloric acid are present, and by the œsophagoscopic findings. There is often an obstruction at the cardia, which yields when steady pressure is made.

Diverticulum is distinguished by its situation in the upper and back part of the œsophagus, the varying intensity of the obstruction, accompanied at times by a visible tumor in the neck, by the use of sounds (Leube's diverticulum sound), and by the œsophagoscopic appearances.

PROGNOSIS. Peptic ulcer of the œsophagus is a serious affection, not only from the danger of hemorrhage and perforation, but also owing to the marked tendency to the formation of stricture, which, though often yielding readily to dilatation, is very likely to recur. Furthermore, it is often a complication of grave diseases, which of themselves bear a bad prognosis. The number of cases diagnosed during life is as yet too small to justify any conclusions as to the exact mortality.

TREATMENT. The indications for treatment in the stage of ulceration are the same as for gastric ulcer. In order to provide conditions favorable for healing, irritation of the ulcer by the passage of food should be reduced to a minimum. Hence, rectal feeding will be in place for a short period, with rest in bed, to be followed by a Leube cure. All articles of diet which might cause mechanical, thermic, or chemical irritation are to be avoided. The general condition of the patient should receive careful attention.

Among drugs which, when given by the mouth, may have a direct

action on the ulcer, silver nitrate ($\frac{1}{6}$ to $\frac{1}{2}$ grain, well diluted three times daily) and bismuth subnitrate (15 grains in suspension once daily) should be mentioned. It is probable that in some cases the drug will remain in contact with the ulcer long enough to exert a beneficial effect. Direct applications to the ulcer by means of the Œsophagoscope probably will not be practicable on account of the danger of hemorrhage. Lavage of the Œsophagus is also contraindicated for the same reason.

In the stage of stenosis, dilatation by means of bougies is usually necessary. This, in mild cases, may effect a complete cure; in others, the occasional passage of sounds must be kept up for a long time. When the stricture is impassable for sounds resort may be had to operative measures, usually gastrotony, with subsequent feeding through the fistula. By this procedure not only is the nutrition rapidly improved, but the small ulcerations so frequently present at the stricture have a chance to heal, spasm ceases, and the Œsophagus may become passable, as in Ewald's case.

In conclusion, I take pleasure in thanking Drs. R. H. Fitz, J. J. Minot, W. L. Richardson, and F. C. Shattuck, for their courtesy in placing the material at my disposal; and Drs. G. B. Magrath, F. B. Mallory, and J. H. Wright, for the use of the autopsy records.

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TABLE OF CASES REPORTED SINCE 1878.
Group I. *Ulcer in Esophagus Only.*

No.	Author.	Sex; age.	Description of ulcer.	Microscopic examination.	Lesions in other organs.	Pain.	Dysphagia.	Hematemesis.	Duration.	Remarks.
1	Quincke	F. 41	Circling ulcer from cardia to bifurcation.	Excludes cancer, (Lange's.)	Cancer of ovary; cancerous peritonitis; abortion.	General abdominal.	.....	Present.	Eleven days.	
2	"	" 66	Numerous confluent ulcers in lower half; perforation in right pleura.	Excludes cancer.	Very large cyst of ovary.	.....	.....	"	A few days.	Perforation after tapping of cyst.
3	Sabel	" 32	Extensive, irregular in lower third, exposing muscularis.	"Shows no cause for the ulcer."	Fibrom of ovary size of man's head.	Epigastric	.....	"	.....	Stools fatty.
4	Chiari	" 58	Extensive in lower half.	Excludes cancer and tuberculosis.	Increased femoral hernia; perforation of bile duct; general peritonitis.	Present.	.....	.....	One week.	Blood in stomach at autopsy.
5	Shields	M. 66	Round ulcer, 1 cm. in diameter, in lower third.	.....	Chronic interstitial nephritis; cirrhosis of liver; hypertrophy L. ventricle.	In front of chest.	of Inconstant.	Coffee grounds.	Six weeks.	
6	Reber	" 47	Circling ulcer, 4.5 cm. broad, just above cardia; scar tissue reaching to 3 cm. above bifurcation.	.....	.....	In epigastrium and lower dorsal region.	Present; obstruction 36 cm. from teeth, due to diverticulum in ulcer.	Coffee grounds.	Four years.	Free HCl present in vomitus.
7	Lindemann	" 18	Oval ulcer, 2x1 cm., just above cardia on posterior wall; edges thickened.	Double pneumothorax from perforation of ulcer; stomach normal.	.....	Epigastric.	.....	.....	.....	Epigastric pain, like that of ulcer, for several years.
8	Christens	F. 25	"Chronic ulceration of lower half."	Tuberculosis of tubes peritoneum, mesenteric glands; appendix abscess; pneumonia.	.....	.....	.....	.....	.....	No history.
9	"	"	"Flat, peptic ulcers" in esophagus.	Marked chronic interstitial nephritis; amyloidosis.	.....	.....	.....	.....	.....	.....

Group I. (Continued).

No.	Author.	Sex; age.	Description of ulcer.	Microscopic examination.	Lesions in other organs.	Pain.	Dysphagia.	Hæmatemesis.	Duration.	Remarks.
10	Eversmann	M. mid-dle-aged.	Extensive; beginning 3 cm. above cardia; perforation into aorta; latter not sclerotic.	Excludes cancer.	Stomach full of blood.	In the chest, on swallowing and passage of sound.	Present.	.....	Three and a half months.	Incumbent obstruction at cardia; sudden death from hæmorrhage.
11	Fränkel	M. 58	Stenosis just above cardia, with radiating scar tissue.	Excludes cancer.	.....	.....	Present.	.....	One year.	Bartender.
12	Tasse	" 49	4 cm. above cardia in right postero-lateral wall; oval ulcer 2.5x1.5 cm.	.....	Aneurysm of aorta at fourth vertebra, adherent to œsophagus.	Slight burning in œsophagus on swallowing.	.....	Profuse.	A few days.	Alcohol; "moderate."
13	Ortman	" 47	Carcinoma near cardia developing from scar of peptic ulcer.	.....	Aspiration pneumonia, with gangrene of lung.	In lower end of gullet on swallowing.	Present.	Absent.	Two years.	Dysphagia first symptom; improvement for one year with dilatation.
14	Rose	" 13	"Latent ulcer of œsophagus."	.....	Perforation into pericardium; purulent pericarditis.	.....	.....	.....	.....	No history.
15	Janeway	F. one year.	Round, 1 cm. diameter, in L. lateral wall, 2.5 cm. above cardia; periosophageal tissue inflamed.	.....	"Infantile paralysis;" dysentery, pericarditis and pleurisy L.	.....	.....	.....	.....	No œsophageal symptoms.
16	Henoeh	— five days.	Deep "ring-shaped" ulcer, 2 cm. diameter, with gray infiltrated base; situation, just above cardia.	.....	Throat normal.	.....	.....	Present, also melæna.	Two days.	Melæna neonatorum.
17	Spiegelberg	M. five days.	Feasized hemorrhagic infiltration with erosion at junction of œsophagus and cardia.	Shows hemorrhagic infiltration, with necrosis.	.....	.....	.....	Present, also melæna.	Two days.	Melæna neonatorum; blood cultures in life sterile.
18	Meyer	F. six days.	Small ulcer with thrombus adherent in R. wall just above cardia.	Inflammatory infiltration; streptococci present in ulcer.	.....	.....	.....	Present, also melæna.	Three days.	Melæna neonatorum.

Group II. *Ulcer at Cardia.*

No.	Author.	Sex; age.	Description of ulcer.	Microscopic examination.	Lesions in other organs.	Pain.	Dysphagia.	Hæmatemesis.	Duration.	Remarks.
19	Quincke	M. 42	Ulcer at cardia extending 1.5 cm. into oesophagus; longitudinal scars above ulcer.	.....	Ulcer also at pylorus; dilatation of stomach.	Present.	Present; inconstant obstruction at cardia.	.....	.....	Pocket formed at seat of ulcer, with valvular action.
20	Carstens	F. 24	" Large perforating ulcer" at junction of oesophagus and cardia.	.....	Tuberculosis of mesenteric and thoracic glands, intestines, peritoneum, tubes.	.....	.....	Stomach full of blood at autopsy.	.....	No history
21	Eversmann	M. 47	Circular ulcer at cardia, extending into oesophagus and to posterior wall of stomach; scar tissue in stomach.	.....	Perforation of that part on swallowing.	.....	Present.	.....	Five months.	Obstruction 42 cm. from teeth; perforation after sounding; clinical diagnosis, cancer.
22	Krokiewicz	" 46	Ulcer at cardia, extending into anterior wall of oesophagus.	.....	Ulcers also at pylorus and lesser curvature; stomach dilated.	Between shoulder-blades.	Present.	Present.	Four weeks.	Free HCl increased; absent later.
23	Zaleski	" 39	Irregular ulcer of lower third of oesophagus and cardia extending a short distance into stomach.	.....	Scar of ulcer at pylorus with stenosis; dilatation of stomach; emphysema of stomach; radiating to miliary tuberculosis.	Severe in epigastrium and lower sternum, radiating to back between shoulder-blades.	.....	Present and cause of death.	Three months.	Free HCl diminished.
24	Fraenkel	" 47	Ulcer 4.5x6 cm. at junction of oesophagus and cardia; scar tissue present in the base.	Chronic inflammatory tissue; gastric glands present in oesophagus.	.....	Severe, epigastric, with tenderness.	.....	Present.	Five months.	Free HCl present, 0.15 per cent.

Group III. *Complicating Ulcers in Other Parts of the Stomach or in the Duodenum.*

No.	Author.	Sex; age	Description of ulcer.	Microscopic examination.	Lesions in other organs.	Pain.	Dysphagia.	Hæmatemesis.	Duration.	Remarks.
25	Quinke	M.	50 Stenosis due to contracted scar at lower end of œsophagus; hypertrophy above.	Inflammatory infiltration.	Scar of ulcer on posterior wall of stomach.	.....	Present.	.....	.....	Gastric symptoms for "a considerable time."
26	Delbove	"	55 Stenosis 3 cm. above cardia, due to scar; typical fibrous radiations.	.....	Perforation of ulcer of anterior wall of stomach.	.....	Present.	Present; re-peated.	re-Five years.	Symptoms of gastric ulcer; eighteen years relief from dilatation; drunkard.
27	Zahn	"	46 Ulcer in lower œsophagus, with hypertrophy above.	Small-cell infiltration; thrombosis of an artery.	Ulcer of duodenum; dilatation of stomach, cirrhosis of liver.	Severe; epigastria.	.....	Present; frequent.	six weeks +	drunkard; red cells, 800,000.
28	Vinjan	"	63 six ulcers in lower fifth, involving almost entire circumference.	.....	Smaller, shallower ulcers near pylorus.	Severe, epigastria of sudden onset.	Absent.	Absent.	Two months.	Severe dyspepsia five years before.
29	Ewald	"	30 Round; 3 cm. diameter, on R. wall just above cardia; perforation into lesser omental cavity.	Excludes cancer.	Duodenal ulcer with stenosis; pulmonary tuberculosis; localized peritonitis.	Severe epigastria, referable to duodenal ulcer.	.....	Frequent.	Thirty days.	Free HCl present; stomach dilated.
30	Fraenkel	"	... Round, with sharp, raised edges and funnel-shaped base, in lowest part of œsophagus.	.....	Similar ulcer in duodenum.	.....	.....	.....	.....	Museum specimen of Rokitański.
31	Kraus	M.	59 Girdling; extending 6 cm. upward from cardia.	Inflammatory infiltration, extravasation of blood.	Ulcer at pylorus; enormous dilatation of stomach.	.....	.....	.....	.....	Stools bloody.
32	Kraus	"	24 Numerous; confluent, extending to muscularis, situated in lower œsophagus; latter dilated.	Small-cell infiltration and extravasation of blood.	Scar of ulcer at duodenum, with stenosis, hour-glass stomach, with dilatation.	Epigastric, very severe.	.....	Repeated, profuse.	.....	.....
33	Hödlmoser	"	35 3.5 cm. in diameter; in lower end of œsophagus; anterior wall.	.....	Two duodenal ulcers, with stenosis, and dilatation of stomach; hypoplasia of aorta.	At lower end of sternum; increased on taking food; tenderness.	Present.	Profuse; causing death.	Six weeks	Symptoms of gastric ulcer five years before.

Group IV. Cases without Autopsy.

No.	Author	Sex; age.	Description of ulcer.	Microscopic examination.	Lesions in other organs.	Pain.	Dysphagia	Hæmatemesis.	Duration.	Remarks.
34	Debove	M. 51	Two stenoses; (1) near cardiac; (2) at level of top of sternum.	.....	.....	At sternum and between shoulder-blades.	Present.	Present; coffee-ground.	Twelve years.	Alcoholic patient; cured by dilatation; no signs of syphilis.
35	Ortmann	" 27	Obstruction 40 cm. from teeth.	.....	Stomach reaches 3 cm. below navel.	Epigastric.	Present.	Present.	Five years.	Sudden onset of dysphagia and pain; cured by dilatation.
36	"	" 30	Obstruction 43 cm. below teeth.	.....	Stomach three fingers below navel; phthisis, third stage.	.....	Present.	.....	Four years.	Improved by dilatation.
37	"	F. adult.	Obstruction 32 cm. from teeth.	.....	.....	Paroxysmal at middle of sternum.	Present.	.....	Several years.	Diagnosed by Quinke; improved by dilatation.
38	"	M. 42	Obstruction 42 cm. from teeth.	.....	Ptosis of stomach.	At xiphoid.	Present.	Present.	Five years.	Free HCl present; relief from dilatation.
39	"	" 28	Obstruction 43 cm. from teeth.	.....	Ptosis of stomach.	At xiphoid on swallowing.	Present.	Absent.	Five years.	Onset with violent pain in chest and stomach, after drinking sour wine; improved by dilatation.
40	Ewald	F. 19	Impassable stricture 30 cm. from teeth.	.....	Partial stenosis of pylorus.	At xiphoid on swallowing.	Present.	Absent.	Two months.	HCl increased; partial recovery after gastrectomy.
41	Starck	" 60	Ulcer, with dark red base and infiltrated edges, in left anterior quadrant, 38 cm. from teeth (oesophagoscope)	.....	.....	Between shoulder-blades.	Present.	.....	Nine months.	Recovery.

PRIMARY SARCOMA OF THE ADRENAL GLAND.

BY I. W. BLACKBURN, M.D.,

PATHOLOGIST TO THE GOVERNMENT HOSPITAL FOR THE INSANE, WASHINGTON, D. C.; PROFESSOR
OF MORBID ANATOMY AND SPECIAL PATHOLOGY, MEDICAL DEPARTMENT, UNI-
VERSITY OF GEORGETOWN, WASHINGTON, D. C.

PRIMARY malignant tumors of the adrenal glands are sufficiently rare to give interest to the report of a case which came under my observation at the postmortem examinations of the present year; and, in connection therewith, to refer to a similar case reported in the *Journal of the American Medical Association*, 1888, vol. x. Some additional interest is attached to these cases, as in neither were there any symptoms of Addison's disease.

Ramsay, in an excellent article in the *Johns Hopkins Hospital Bulletin*, 1899, vol. x., has collected from literature and studied sixty-seven cases of primary malignant tumors of the adrenals, three of which were his own. To this article I shall frequently have need to refer, and here acknowledge my indebtedness.

The difficulty of clinical diagnosis of tumors of the adrenals, especially those without skin affection to suggest them, was in my two cases increased by the mental condition of the patients, both of whom were demented. It is only fair, however, to state that in the first case tumor of the abdomen was recognized during life; and that in the second case malignant growth of some kind was suspected from the symptom-complex, and from the chemical and bacteriological examination of the stomach contents, though the supposed location of the growth was found to have been incorrect. For the brief history of my first case and the details of the post-mortem notes, I would refer to the original article; I reproduce, however, two photographs of the gross specimen (Figs. 1 and 2). The following is the recorded history of the present case, for which I am indebted to my colleague, Dr. H. R. Hummer, in whose service the case occurred.

Case No. 12,570. L. S., male, aged seventy-eight years, white, late soldier; nativity, Ohio. Mental disease: senile dementia, duration about sixteen years. Admitted to the Government Hospital for the Insane June 28, 1901.

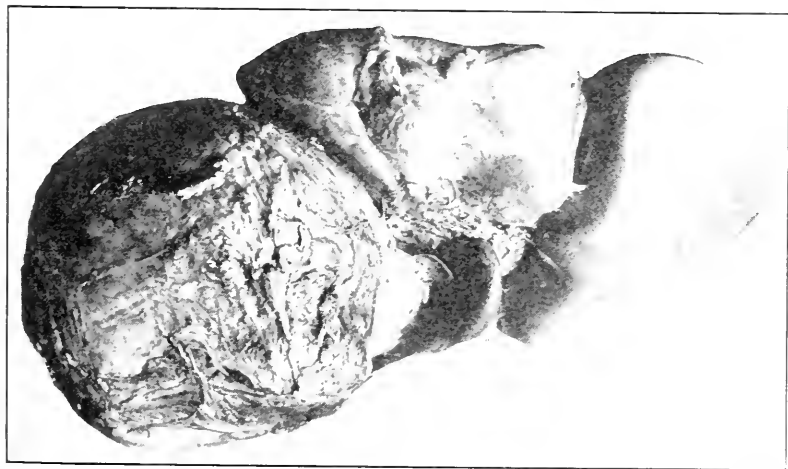
The history obtained on admission states that the patient was at times emotional and abusive, and was delusional. Later on loss of memory for recent events was a prominent feature, and he was violent in temper, quarrelsome, and threatened his attendants. On admission to this hospital, physical examination showed some enlargement of the heart and a mitral regurgitant murmur; the mental reactions were sluggish; it was apparently a simple case of senile dementia. On July 29, 1901, he fell and sustained a

FIG. 1



A section of the adrenal tumor (Autopsy No. 203 removed by the writer postmortem, and reported in the *Journal of the American Medical Association* in 1888. This tumor was about the size of an adult head and weighed 2757 grams. The histological structure was almost identical with the second tumor reported herewith, but it was not pigmented, and there were no metastases.

FIG. 2



View of the tumor shown in section in Fig. 1, showing the size of the growth relative to that of the liver, the under surface of the latter being shown.

fracture of the right femur near, or within the hip-joint, after which he was obliged to remain in bed. In bed the patient slept well, was quiet, and did not complain of pain; no union of the fractured bone took place, though the acute symptoms duly subsided.

From the above date until October 12, 1904, the progress of the case presented nothing of especial note. At this time it was observed that the patient was rapidly losing weight, having fallen off six and three-quarter pounds in three weeks.

October 15th, the injured limb began to swell, and at this time urine analysis showed purulent cystitis. October 27th, he refused nourishment, saying that his stomach was decayed. He had grown emaciated; his pulse was rapid and weak; urine scanty and purulent at times; and he began to groan distressingly, but whether from actual pain or not could not be determined owing to his mental condition.

From the time of the onset of these graver symptoms he took but a little liquid food, and that only with much persuasion. Suspecting some disease of the stomach from the fact that he vomited occasionally, a test-meal was attempted, but could not be given.

November 19th his stomach was washed until clear water returned, and on the 22d he was given the test breakfast through the stomach tube and the contents therewith withdrawn. The material from the stomach was examined and hydrochloric acid was found to be absent; lactic acid was present; and the Oppler-Boas bacilli were found; suggesting carcinoma of the stomach, though the more characteristic symptoms were absent.

The patient had continued to lose flesh rapidly, having lost twenty pounds in less than two months. He had some cough and loose bronchial rales, but was too weak to expectorate, and dullness began to be distinguishable in the posterior portion of both lungs. Sputum for examination could not be obtained. The temperature had occasionally reached 100° F., but was usually subnormal; pulse always about 100 to the minute; respirations 27 per minute, becoming much more rapid a day or two before he died.

During his last illness repeated examinations of the abdomen failed to elicit any pain, and no tumor could be felt. The skin had apparently a slightly increased yellowish tint attributed to hamatogenous jaundice or cachexia, but no bronzing of the skin could be detected.

In the latter part of his illness the secretion of urine had become scanty, sometimes less than two ounces in twenty-four hours; the prostate gland was known to be enlarged, and in the semipurulent urine were numerous minute calculi or gravel. The patient died of general exhaustion and pulmonary edema, November 23, 1904.

From the synopsis of the clinical history it may be seen that the patient had some of the symptoms which may be considered as characteristic of adrenal tumor, though certainly not sufficient

for diagnosis of the condition in the absence of palpable tumor and bronzing of the skin. Pain of indefinite character was undoubtedly present toward the last, but it could not be located nor elicited by abdominal palpation. Marked and steadily increasing weakness, rapid emaciation, anæmia, loss of appetite, and digestive disturbances were noteworthy. Circulatory disorder was indicated by rapid pulse, weak cardiac action, and œdema of the legs. The temperature was at times slightly above the normal, but was at other times subnormal, the slight rise being probably influenced by the bronchial inflammation. Hæmaturia was never observed though the calculous disease might of itself have caused it.

Tumor of any kind might not have been suspected if the stomach derangement and other symptoms had not suggested gastric tumor, and the examination of the contents of the stomach apparently confirmed the diagnosis of cancer.

It is interesting to note in this connection that the researches of Professor B. Moore (*Proceedings Royal Society*, May 24, 1905) show that in malignant disease of any organ there is marked diminution of free hydrochloric acid in the stomach in all cases below 1 per cent., or else an entire absence of this substance. The knowledge of this fact, however, while it would have in a measure strengthened the diagnosis of tumor, could have in no way aided in localizing the growth in the adrenal gland.

It is well known that HCl may be absent in chronic atrophic gastritis, but lactic acid is apt to be absent also, therefore the combination found in our analysis of the test-meal material was to say the least unusual and misleading.

Autopsy (No. 1914). Examination fourteen hours after death. Body, though it has evidently lost much superficial fat, is still not greatly emaciated. The skin shows the usual death pallor, but no pigmentation nor other pathological condition can be noticed. The usual evidences of fracture of the femur at the right hip joint are noted.

Cranium. Skull normal; dura adherent to the bone.

Brain weight: 1240 grams. Pia œdematous and slightly opaque; convolutions considerably atrophied. Arteries at the base show some patches of sclerosis and are a little more tortuous and irregular in calibre than normal. Section of the organ shows nothing abnormal in the interior except slight œdema.

Thorax. The right lung is adherent posteriorly and shows some hypostatic exudation; the surface is studded over with small rounded nodules, varying in size from a microscopic granule to a node about 2 cm. in diameter. Section shows the parenchyma of the lung full of nodules of similar sizes, and uniformly distributed. The nodules are grayish red in color, and some are slightly mottled with dark pigmented areas. They are moderately firm, usually round, and each nodule remains distinctly circumscribed. The left lung

is free from pleural adhesions; it presents the same general appearance as the right and contains great numbers of similar nodules, except that some of the subpleural nodes of the larger size at the lower margin of the lung have become pedunculated. Section of the lung tissue shows partial solidification of the posterior portions of both; some carbon pigmentation, and some mucopurulent secretion in the bronchi. The left lung weighs 560 grams, the right, 730 grams.

Heart. Weight 420 grams. The organ is slightly dilated and is relaxed. Pulmonary valves normal; tricuspid orifice slightly stretched and probably was incompetent, but the segments are normal. Aortic valves are a little thickened and calcareous; mitral valves slightly thickened, but probably competent. Lower part of the aortic arch sclerotic and calcareous, and some patches are found at the lower part of the vessel.

FIG. 3



The tumor of the right adrenal gland (Autopsy No. 1911), sectioned in the middle to show its structure and shown in relation to the kidney, which it nearly equals in size. The section shows the appearance of the tumor tissue, the inferior broken down by degeneration, and the more solid tumor tissue mottled by hemorrhage and pigmentation. The capsule is seen to be very distinct, but no septa enter the tumor, the appearance of such being the looser, more degenerated portions of the tumor between the more actively growing centres. The kidney shows a slightly granular surface, indicating some interstitial change, but no secondary tumor growths are seen on the surface shown.

The walls of the heart contain numerous nodules of a grayish red color, slightly mottled with brownish pigment areas, some of which are about one and one-half cm. in diameter, some of minute size. They are found in all parts of the heart, but are most numerous in the walls of the ventricles. On section they are rounded in form, some lie immediately beneath the epicardium and project

slightly beyond the general surface, and some lie deep within the myocardium.

Abdomen. No increase of abdominal fluid; some small tumor nodes noted on inspection of omentum and mesentery.

Spleen. Weight, 320 grams. The capsule shows a number of patches of cartilaginous tissue, some of which are calcified. The pulp is soft, otherwise nothing abnormal is noted on section.

Kidneys. On attempting to remove the right kidney it is found to be in close relation with a soft tumor about the size of the kidney and occupying the position of the adrenal gland. Both kidney and tumor are embedded in perinephritic fat, and are removed together. The tumor is ovoid in shape, soft, almost fluctuant, and evidently takes the place of the adrenal gland. The ascending vena cava lies in close relation to its inner border, and a vein, probably the adrenal, enters the tumor (Fig. 3).

The tumor is 12.50 cm. in length; 6.50 cm. in breadth, and somewhat less in thickness. The kidney and tumor together weigh 500 grams; probably each weighs 250 grams, as they were not separated. Section through the growth made parallel with the anterior face of the kidney shows a softened hemorrhagic tumor the central portions of which are much broken down and filled with thin bloody fluid. The more consistent tissue is grayish red in color, mottled with blackish pigment, and the central portion consists of shreddy blood-stained tissue and semicoagulated blood. The ascending vena cava contains nothing abnormal, and the vein which enters the tumor is pervious, and is lost in the tissue. To the naked eye no trace of adrenal tissue can be seen, and the capsule of the gland seems to have been enlarged and greatly thickened to form the limits of the new-growth.

The kidney is preserved entire with the tumor; a few whitish nodules are seen in the cortex, the capsule adheres slightly, and the surface is faintly granular. The perinephritic fat contains a few grayish-red nodules, probably secondary tumor deposits.

The left kidney and its adrenal gland are next examined. The kidney weighs 200 grams; in appearance it is the same as the right, and like it contains a few small tumor deposits. The left adrenal gland is found to be enlarged and a transverse section reveals a rounded tumor mass about 3.5 cm. in average diameter. The tissue of this tumor is grayish red in color and there remains between it and the capsule of the gland a thin yellow line of tissue, the remnant of the adrenal gland. The tumor occupies the central portion of the gland, the extremities being uninvaded.

The ureters are a little dilated. The bladder is slightly dilated and shows traces of chronic catarrh and numerous small calculi, some of which are about the size of a pea.

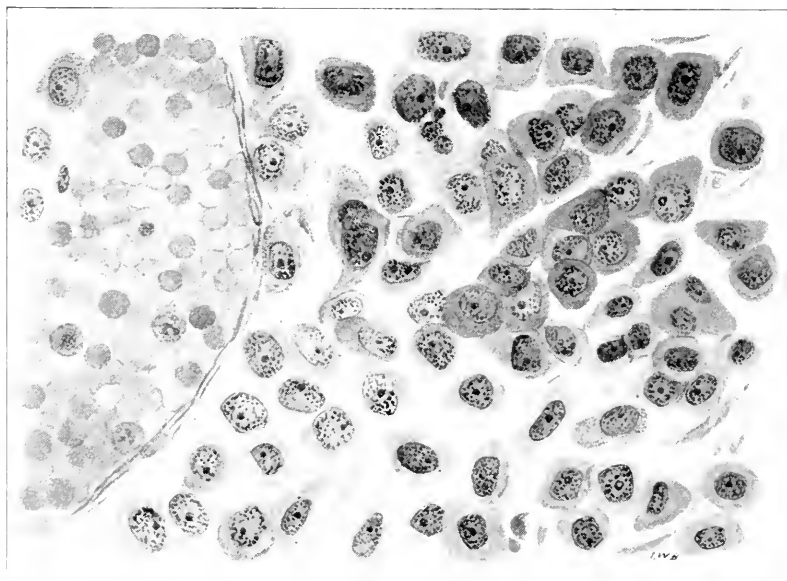
The liver weighs 1560 grams. It contains a few small secondary

tumors, of whitish color, the largest being in the anterior border of the left lobe. The liver tissue, the gall-bladder, and biliary ducts seem normal.

The pancreas is sectioned lengthwise and found to contain a few nodules of tumor deposit in the caudal portion, recognized by their color and slight pigmentary deposits. The peripancreatic fat, the mesocolon, and mesentery contain a few small tumor nodules.

The stomach is dilated and the mucous membrane is coated with tough mucus. A small ulcer of uncertain character occupies the upper part of the duodenum, about an inch from the pylorus. No secondary tumor deposits in any part of the alimentary tract, and the ulcer is not cancerous.

FIG. 1



Structure of tumor in Antopsy No. 1914. Actual field drawn with the camera lucida. Leitz¹ 12, ocular No. 3. The field drawn shows the arrangement of the cells, the scanty intercellular substance, faintly granular condition of some of the cells, the prominent nuclei, and a large sarcomatous bloodvessel with eosin-stained red cells and a few leukocytes of various kinds. From a secondary nodule in the lung. (Reduced.)

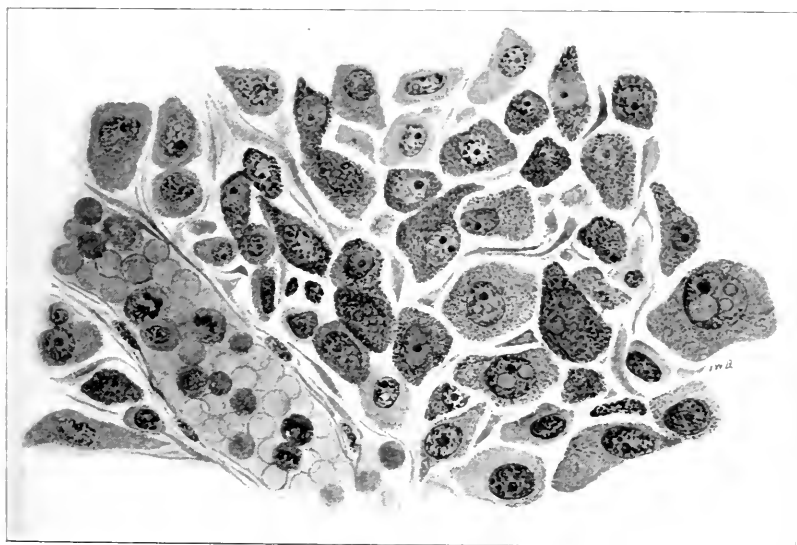
The head of the femur is found to be bound to the shaft by the capsule of the joint, the periosteum, and some fibrous tissue. The neck of the bone is nearly gone and the head lies at right angles to the shaft, and the trochanter major lies against the acetabulum. The diagnosis of this injury is intracapsular fracture of the femur.

The pathological diagnosis from the gross appearances of the growths is primary melanotic sarcoma of the right adrenal gland, with extensive metastases, involving the left adrenal, lungs, heart,

liver, kidneys, pancreas, peripancreatic and perinephritic fat, omentum, mesentery, and mesocolon.

Microscopic Examination of the Tumor. The predominating types of cells are shown in Fig. 4. They are usually more or less polygonal by mutual pressure, though where the tissue is less dense they assume the rounded form. The cell-bodies stain lightly in hæmatoxylin and eosin, and even with the highest amplification are only occasionally faintly granular. They vary in size within narrow limits, even in the typical parts of the tissue; but in the secondary nodules and regions in which degenerative changes are taking place they differ greatly in size and shape, as shown in Fig. 5 and in Fig. 6, which shows the great variety in size, shape, and

FIG. 5



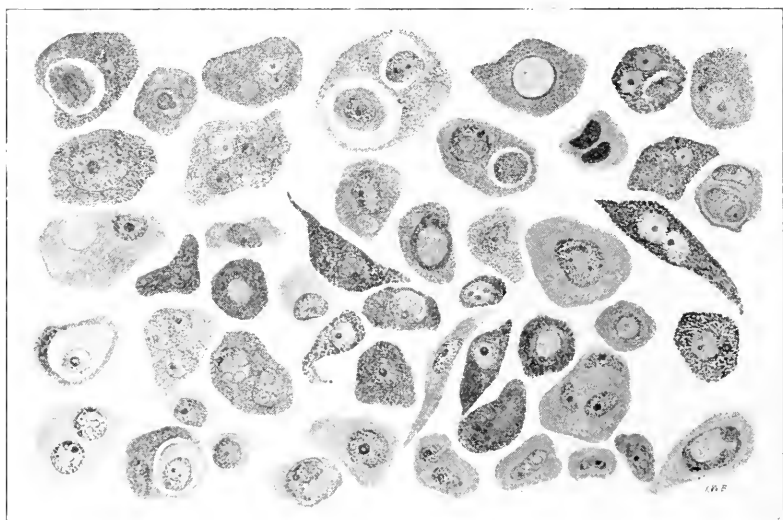
Field drawn from a secondary nodule in the lung, showing enlarged and pigmented cells with degenerated nuclei. The great irregularity in size and form of the tumor cells, their shapes influenced by mutual pressure, the delicate intercellular substance, and some enlarged and vacuolated nuclei are shown; and a sarcomatous bloodvessel with eosin-stained erythrocytes, lymphocytes, and polymorphonuclear cells filling the lumen, and flattened endothelium and a few strands of delicate connective tissue forming the wall. Leitz¹₁₂, ocular No. 3. (Reduced.)

degenerative changes in cells collected from various secondary nodules in the lungs. It is noteworthy that many small, more or less rounded cells, with nuclei as large as those of the larger elements, and relatively little cell protoplasm, lie in the midst of the cells of large size and varied shapes. These are probably young cells, as they are more numerous in the growing portions of the tumor, and among the cells invading the tissues in the vicinity of the secondary deposits. Many elongated or spindle cells are found

among those of other shapes, and entering into the formation of indistinct alveoli in some parts of the tumor; but these cells form a very unimportant feature of the structure and alveolar arrangement is only occasionally demonstrable.

A marked peculiarity of growth is seen in some parts of the tumor, and in some of the secondary nodules. This is the arrangement of the tumor cells into elongated trabeculae, or rows two or three cells wide, strongly suggesting the normal structure of the zona fasciculata and zona reticularis of the adrenal gland. Sometimes capillary bloodvessels can be demonstrated between these rows of cells, which further suggests the normal structure (Fig. 7). This in my opinion is an evidence of the origin of the tumor cells from

FIG. 6



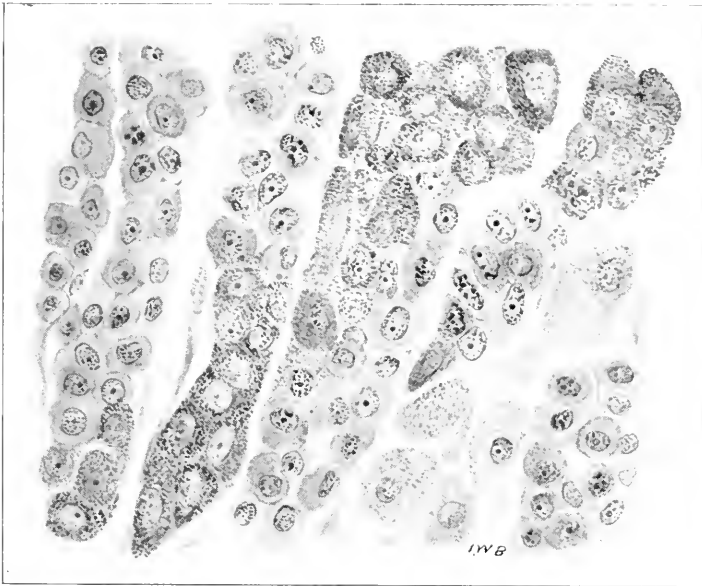
In this plate have been collected a number of cells from various fields of secondary nodules of the lungs. Almost all of the types of normal and degenerated tumor cells are here represented. Vacuolation of the cells and their nuclei, and pigmentation in various stages are shown, cells of bizarre forms and a number of so-called "cell inclusions" known to the older pathologists as endogenous cells or "daughter cells." Almost every phase of nuclear degeneration and cytoplasmic pigmentation is represented. Drawn with camera lucida. Leitz $\frac{1}{12}$, ocular No. 3. (Reduced.)

the epithelial elements of the adrenal, the cells following the law of hereditary resemblance to the parent tissue well recognized in neoplastic growths.

The nuclei of the cells present more uniformity in size and structure, except when they are altered by degeneration. They are quite distinctly stained by ordinary nuclear stains, show a coarse intranuclear reticulum, limited by a distinct nuclear membrane, and contain as a rule one or more prominent nucleoli. The nuclei

almost exactly resemble those of the adrenal epithelium. In fields where the pigmentation and degeneration of the cytoplasm are evident the nuclei show most marked difference in size, and share in the degenerative processes. Vacuolation is common, sometimes occupying the whole nucleus; the nuclei are frequently divided into two or more vacuole-like bodies, each containing a nucleolus; and occasionally minute vacuoles. A few cells contain two nuclei in close proximity indicating nuclear division; a few have three or four nuclei, usually smaller than the common single forms; and occasionally the partial division of the cell-body indicates direct cell multiplication, but no distinct evidence is seen of indirect cell

FIG. 7



Field from the primary tumor of the right adrenal gland from the periphery of the growth near the capsule. Several trabeculae of cells, from two to three or four cells thick, extend in parallel rows, strongly suggesting the normal gland. Spaces, in some instances found to be capillary blood channels, are seen between the rows of cells. At the lower right corner are several larger cells and cell-fragments which are adrenal cells crowded together, compressed and degenerated by the advance of the tumor elements. Leitz $\frac{1}{12}$, ocular No. 3. (Reduced.)

division or karyokinesis. Quite a number of the so-called "cell inclusions" are found; in some cases the cell contains a clearly defined "daughter cell," which is separated from the inclosing cell by a clear space, and stains more distinctly; in addition its own nucleus is either normal or more or less degenerated. Several of these ill-understood elements appear in Fig. 6, which also shows a remarkable collection of cells and nuclei in various stages of retrogressive change and pigmentation.

The pigment seems to be very irregularly distributed, and by

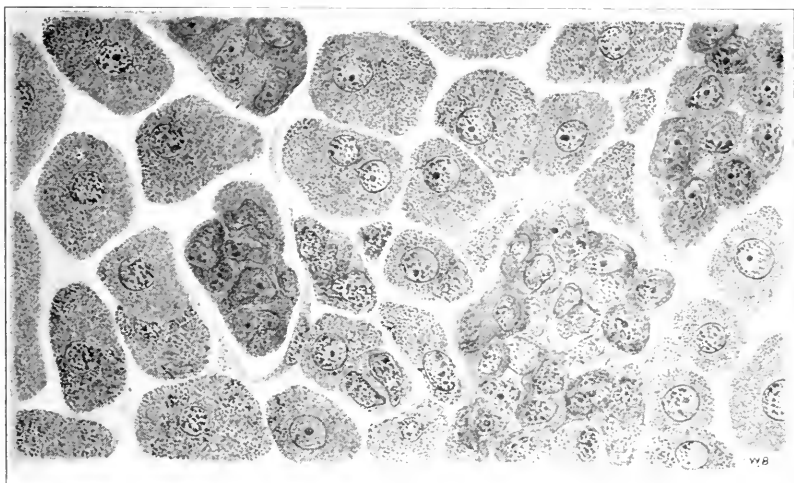
far the greater number of the cells are unaffected. In some parts of the primary tumor, and in many secondary nodules, pigment is absent, but when present all kinds of cells are affected. Sometimes a single pigmented cell, or a group of two or three, may be found isolated in the midst of an entire field of non-pigmented cells. In some of the trabeculae or rows of cells a portion may be pigmented, while the remainder is unchanged. So far as can be determined the pigment is confined to the protoplasm of the cells, and the nuclei stain a pale rose tint in eosin, while the cytoplasm may be completely filled with yellow pigment granules. In some cases the pigment has accumulated until the nuclei are obscured, but apparently not pigmented, or at least not granular. In the degenerated nuclei in which the intranuclear reticulum has disappeared, the nuclei are yellow and ill defined owing to the degeneration of the surrounding cytoplasm.

It is difficult to describe the pigmentation of the cells. The alteration exists in all degrees from the faintest yellowish tint, which causes the cell-body to assume a salmon pink hue when stained, to a deep yellow color, with brownish-yellow granules. It is more difficult to decide as to the true nature and origin of the pigment. To the ordinary tests, and in microscopic and macroscopic appearances it answers to melanin; and when tested with hydrochloric acid and ferrocyanide of potassium it is found to contain no iron. It may be a direct transmission of the metabolic pigment-forming function of the cells of the zona reticularis of the adrenal gland; in which case it would be some evidence of the derivation of the tumor cells from the epithelial cells of the gland; or it may be in part a degenerative change in the tumor elements, as the pigmented cells are more apt to assume unusual form and size, and the nuclei of these cells are more commonly degenerated.

In the right adrenal tumor the pigment is in streaks and patches; in the left adrenal the cells are but little pigmented; in some of the secondary tumors the pigment is absent, and in some of the pulmonary nodules the cells are nearly all pigmented and in others the pigment is scanty. Though irregularity in pigmentation is common in tumors of this class, I have thought it possible that the tumor cells were derived from more than one zone of the cortex of the adrenal gland primarily affected. The cells of the zona glomerulosa and the zona fasciculata are not pigmented; the cells of the zona reticularis are so normally, and the pigment much resembles that of the tumor cells. The medullary cells are of doubtful embryogenesis, and may be thought of as sources of abnormal growth, but these cells are not pigmented. The natural conclusion is that the tumor cells are derivatives from the adrenal cells of the zona reticularis, and possibly the other cortical zones of the adrenal primarily affected, and this was apparently the right gland.

Sections from the *primary tumor* were studied in connection with those found in other organs, and as is the rule in secondary tumor growths, the neoplastic tissue everywhere was found to be remarkably uniform in structure. The tissue in the right adrenal had degenerated more than in the secondary nodules, and, therefore, the more minute details were better studied in these, especially in those of the lung. The mode of invasion of the adrenal tissue itself could only be studied in the left gland, as only microscopic remnants of the right adrenal tissue remained. Sections were examined from all the affected organs, revealing some peculiarities of growth, which may be given in detail.

FIG. 8



Field from the advancing border of the nodule in the left adrenal gland, showing portions of four clumps of tumor cells lying in the midst of the adrenal cells remaining near the capsule. The tumor cells stain more deeply than the adrenal elements, and they are seen to lie in compact masses apparently without intercellular spaces, and the individual cells are hard to outline; whereas, the adrenal cells do not lie in contact in this field, though no intercellular substance can be demonstrated. It is probable that in many instances these intercellular spaces are artificially produced during preparation of the tissue. The adrenal cells are granular and in places compressed; the tumor masses stain a little darker and are therefore easily distinguished. Leitz '12, ocular No. 3. (Reduced)

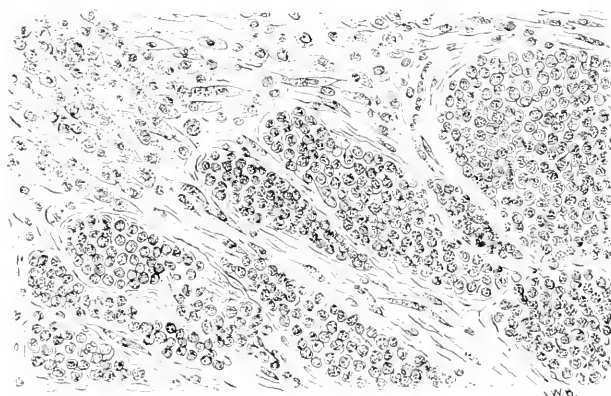
I should conclude from the gross appearance that the tumor mass in the *left adrenal* was probably secondary and that the invasion of the tissue was from within outward. The microscopic study seems to confirm this, as a narrow line of adrenal tissue yet remains between the tumor mass and the capsule. Between the two there is a region where the tumor cells have insinuated themselves between the adrenal elements and have compressed these cells into elongated spindles, the nuclei having as a rule retained their size and shape (Figs. 8 and 9).

In some fields of this tumor the cells are arranged in elongated alveoli which I have mentioned elsewhere as suggesting the mode of growth of the normal gland. In other fields the alveolar arrangement is more like that of ordinary alveolar sarcoma, and on the border-line the tumor cells often lie isolated among the adrenal epithelial elements, from which they can with some difficulty be distinguished.

The tumor masses as a rule stain slightly deeper in nuclear stains, and the cells are a little smaller and more densely aggregated than the surrounding adrenal cells. Pigmentation is not a marked feature in the tumor of the left adrenal; otherwise it much resembles the growth in the right, but the tissue is less degenerated.

The nodules in the *heart* are practically identical in structure with that of the left adrenal. The pigmented cells are rather more common, and have the same irregularity of distribution as noted

FIG. 9



A low-power view, showing the encroachment of the tumor cell-masses upon the remaining adrenal tissue of the left adrenal and the compression of the epithelial cells into spindle shapes. 200.

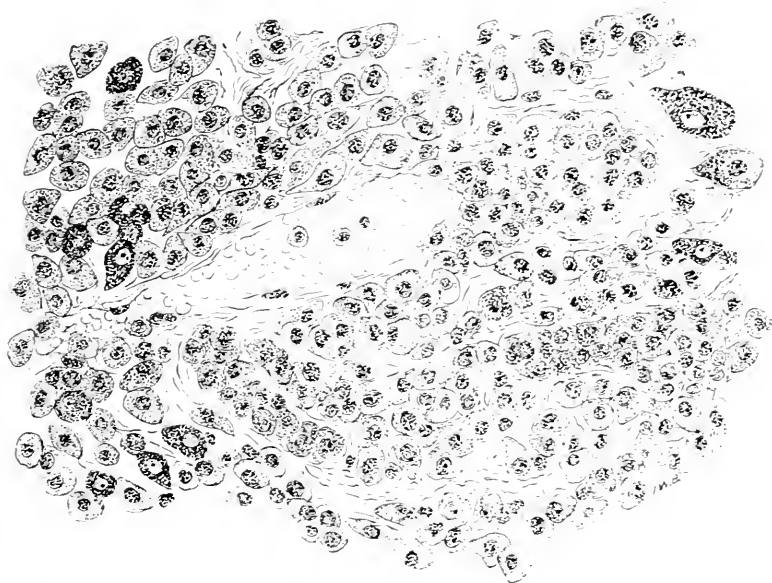
elsewhere. Where the heart muscle lies adjoining, the tumor cells are found between the more or less compressed muscle fibres. Where the tumor masses have expanded laterally the muscle fibres are so flattened as to be scarcely recognizable. Where the connective tissue of the intermuscular septa forms the boundary of the tumor the sarcoma cells are seen to fill the lymph spaces, lying in elongated rows. In cases where the nodules are adjoining the epicardium a layer of muscle tissue has been carried in advance and become compressed against the connective tissue.

The muscle cells of the myocardium in general show a slight degree of pigmentation in the vicinity of the nuclei, but are otherwise normal.

In the *pancreas* the secondary deposits have the same character as elsewhere and are found in the connective tissue of the gland. The larger nodules have compressed the glandular tissue in the vicinity; in other respects the gland seems normal.

The *liver* nodules show the typical structure of the primary tumor, though very few pigmented cells are found. The tumor cells are quite uniform in size, polymorphous from pressure, and in some fields a tendency to alveolar arrangement is seen, and in the thinner portions of the sections some grouping of the cells

FIG. 10



This figure represents a field from a secondary nodule of the lung, showing the tumor cells arranged in trabeculae, suggesting the structure of the adrenal gland; a large sarcomatous blood vessel; the general structure of the secondary growths; and a few pigmented cells.
 X 300.

(These drawings were done with the camera lucida to secure the cell outlines. The stippling is used for shading and not to represent the protoplasmic structure. Pigmentation is represented by heavy granular shading to secure the general effect.)

around the bloodvessels. In most cases a distinct connective-tissue capsule limits the growth, and occasionally the tumor cells have penetrated the boundary and invaded the spaces between the liver cells. In the vicinity of the larger nodes the hepatic cells are compressed into spindle shapes, and degenerated; more remote from the growths these cells show a few pigment granules, and some contain fat globules from infiltration.

The secondary nodules in the *omentum* and *mesentery* present the same general structure as elsewhere, and need not be separately

described. The same may be said of the *renal* deposits. The kidney tissue shows slight interstitial increase and some cloudiness of the epithelium.

The secondary tumor nodules in the *lungs* present wide differences in the degree of pigmentation and degeneration of the cells, and in the details of structure of the tumor tissue. In some nodes the cells are quite uniform in size and shape, and are devoid of pigment, while perhaps in an adjoining nodule the cells are of the most varied shapes and sizes, and show every degeneration and degeneration (Figs. 4 and 5).

The nuclear degeneration so pronounced in some probably indicates an impairment of the whole cell. It is probable that the proliferation of the nuclei with partial division is indicative of the same thing. Quite a number of cells are found containing two or more nuclei with, in some cases, partial division of the cell-body.

In some fields a marked tendency is seen for the cells to arrange themselves in elongated rows, suggesting the structure of the primary tumor and the adrenal gland (Fig. 10). These clumps and rows of cells take the staining a little better than the surrounding cells, and are thus differentiated. The sarcomatous bloodvessels in the lung nodules are large and full of blood, and show imperfectly developed walls (Figs. 4, 5, and 10). Some secondary nodules, especially in the lungs, are remarkably vascular, and occasionally the cells grouped in the vicinity seem to have some relation to the vessel walls, probably proliferation nearest the supply of nutrition.

The *lung tissue* included in the tumor sections examined shows the effects of bronchitis and peribronchitis. The bronchioles are filled with pus exudate, the alveolar walls and the peribronchial tissue are thickened, and coal-dust pigment is found in clumps in the connective tissue. Small collections of lymphoid cells are found here and there, indicating active interstitial inflammation. The alveoli contain leukocytes, epithelial cells, and some cells filled with black pigment granules—"dust cells." The bloodvessels of the lung tissue are engorged and some contain dark pigment granules of uncertain origin, possibly sarcomatous pigment.

Some of the lymph spaces in the vicinity of the tumor nodules contain sarcomatous cells and around the larger nodes the lung tissue is compressed.

CONCLUSIONS AS TO THE DIAGNOSIS AND NATURE OF THE TUMOR. Primary tumors of the adrenal glands are sarcoma, carcinoma, adenoma, hypernephroma, and, more rarely, glioma, ganglionic neuroma, and endothelioma. Of the primary malignant tumors those commonly recognized are sarcoma in its various forms and carcinoma; and to these we must add malignant hypernephroma; and, according to Prudden, "certain large vascular and hemorrhagic adeno-

mata which may invade the neighboring vessels and form metastases."

Sarcoma is said to be much more frequent than carcinoma, though in the sixty-seven cases collected by Ramsay thirty-seven were carcinoma and thirty sarcoma. It is highly probable that careful histological study would greatly alter these figures.

Primary sarcoma of the adrenal must originate in either the connective tissue of the gland or the epithelium. The latter being of mesodermic origin according to the best authorities, would be histogenetically capable of forming a sarcoma, and if such origin be established we have a tumor not differing in embryogenesis from ordinary sarcoma, though derived from mesodermal cells which have undergone marked morphological differentiation.

If carcinoma be derived from the adrenal gland it must originate from the epithelial elements, while the connective tissue of the gland forms its stroma; or have an origin in misplaced tissue of other blastodermic layers. It is hard to conceive how the same histological elements can give rise to tumors of widely different character; but the same difficulty arises in case of these tumors in any of the mesodermic epithelial structures. Carcinoma of the kidney is comparatively rare, and Prudden says carcinoma of the adrenal is not common. It is indeed probable that many cases of malignant tumor of these mesodermic glands are histologically, as well as embryologically, more closely related to the sarcomata than to the carcinomata. In my opinion the establishment of the histogenesis of any given tumor is of more importance than the sometimes forced assignment of the growth to any arbitrary class. The tumor under consideration presents marked characteristics of structure which indicate that it was a development from the adrenal epithelial cells, rather than from any other constituent of the organ. It does not present the characteristic structure of any form of cancer, and while it preserves to a degree the normal histology of the gland sufficiently to merit the term adenoid, it is certainly not an adenoma.

The gross appearance of the tumor and the histological structure are not those of hypernephroma, as usually described and figured by authors and studied also by me. In no part of any of the tumors is there any acini-like structure, with open alveoli (sometimes filled with blood), and with walls lined with more or less columnar or cuboidal cells resting upon the capillary walls, such as appears to be characteristic of hypernephroma. The cells are not fatty, and there are no "clear cells," and no definite relationship of the cells to the capillaries, as usually described. The lack of uniformity in size and shape of the cells, the presence of an indefinite but demonstrable intercellular substance, and the mode of invasion of the tumor in the vicinity of the growths, aside from other histological details, seem to be diagnostic of sarcoma. If

hypernephroma exists as an entity it should have a definite and usually recognizable structure, but if it be decided that all growths arising from adrenal epithelium irrespective of histological details should be so designated, and at the same time the capability of adrenal cells to form a sarcomatous tumor be denied, the growth in question may be called a hypernephroma.

From the morphology of the cells, their fasciculated arrangement in some fields of both primary and secondary tumors, suggesting the structure of adrenal tissue, and finally from the pigmentation of the tumor cells, I have concluded that the cells of the growth developed from those of the zona reticularis of the right adrenal gland with possibly contribution from other cortical layers. That it was malignant in the ordinary sense is shown by the extensive metastasis, though local invasion in the primary situation was prevented by the resistant capsule.

The general appearance of the growth under the microscope is that of large round-celled sarcoma, with a tendency to alveolar arrangement in some fields. It unquestionably more closely resembles this class of growths than any other, and if it be desirable to give it a name, from its histological structure and from the probable histogenesis, I should call the growth a large round-celled adenoid melanotic sarcoma, believing that in the present unsettled state of our knowledge of the subject such tumors may be brought under the general class of sarcomata, however modified.

A CASE OF NARCOLEPSY, FROM A SPECIFIC INFECTION TRANSMITTED THROUGH FIVE GENERATIONS.

BY ALBERT N. BLODGETT, M.D.,

OF BOSTON, MASS.

IN a recent article, F. Raymond (*Archives Gén. de Médecine*, 1905, No. 25) alludes to the pathological varieties of sleep, especially in relation to the states of slumber which are associated with some forms of cerebral tumors; and after describing the phenomena accompanying normal slumber, he mentions a condition which would seem to represent the border-line between normal sleep and the unconsciousness often accompanying recognizable lesions of the cerebral structures. He states that mental hebetude and abnormal slumberous conditions are often observed among the first indications of serious nervous or mental impairment—that is, an increased inclination to sleep which may or may not be associated with

symptoms of disordered mental or motor activity—and varying in degree of intensity and diversity of direction, as well as in the character of its manifestation, and which may later progress to a stage of absolute coma. Among these somnolent conditions he includes narcolepsy, which was first so called by Gélinau (*Gaz. des Hôpitaux*, 1882), though the same condition had been recognized since 1861 by Casse, Marotte, Labbé, and others. Gélinau thought this disorder to depend upon a special neurosis, while Ballet believed it to be due to the action of some toxin of unknown nature within the body of the individual. This view has prevailed, with a few notable exceptions, among most of the observers who have reported such cases since the appearance of Ballet's communication.

True narcolepsy, according to Raymond, is characterized by a sudden and irresistible inclination to sleep, coming upon the individual outside the hours usually passed in slumber, and appearing with a more or less regular periodicity and with variable duration of the somnolency. He states that the person is overpowered by sleep in the midst of his ordinary occupations, and has noted the condition to arise under the most unexpected circumstances, even during meals at table. It is more frequently observed among persons who are subject to gout, rheumatism, or obesity, as well as in the course of the different autointoxications, renal, hepatic, and those due to gastrointestinal fermentations, etc. It may also accompany the different acute febrile infections. So far as I can determine from the material at my disposition, the actual specific agent of the supposed toxic action has not in any instance been detected or its nature defined.

I am able to present the notes of a case of narcolepsy in which the causative action of a specific infective agent is believed to be the source of the disorder. In this direction the heredity of the case is interesting.

The patient is a woman, about sixty-five years old, single. Her paternal grandfather was of old pilgrim stock, and was in early life strong and robust. He followed the sea, making some long voyages to the East, also to the various coasts of Europe, and during the period of the wars with England took some part in the maritime portion of that struggle. He was in the Port of St. Petersburg at the time of the disastrous retreat of Napoleon. He was married during his early manhood, at the most active period of his career. On his return from a long voyage he was found to be ill, and it is said that he had "the bad disease," for which he was under the treatment of that day for an indefinite time. Not much reliable information can be gathered upon that point at this late day, but the study of the lives of his descendants is, at the least, suggestive in diagnosis. This grandfather died in the '40s of the last century at an advanced age, leaving a large family, who

all reached maturity, with the exception of one or two who died in infancy from unknown causes. Each member of this (the second) generation bore some inherited constitutional taint, but in each member of this generation the particular form of stigma varied from that of another. The following is a brief outline of the special features in eight of these individuals whom I will designate as A, B, C, D, E, F, G, H.

A. was a daughter, who resided in a large city, and was a highly cultured and very intellectual lady; excelling especially in musical and artistic ability, and occupying an enviable position in society. Her health was always delicate, and she suffered in middle life from some affection of the eyes, of progressive nature, for which no treatment was effective, and which resulted in total blindness. The malady was not the cause of physical pain, and her health was not apparently greatly impaired, as she went about for many years and enjoyed herself in a manner which was astonishing to those who knew of her affliction. She died at an earlier age than any of her family who had survived childhood, at about forty-five years. The cause of death is not known.

B was a son who married early and had a numerous family, concerning eight members of which I have fairly accurate information. B himself was able to work at his trade during almost his entire life, but at about the age of sixty he suffered from "rheumatism," of slow and chronic character. After a few years he was the subject of a gradual decline of mental power, and at length became almost an imbecile. There were no symptoms of general paralysis of the insane.

C was a son who married early and had three children. He was, during his younger years, in good health, but at about the age of thirty-five was the subject of a "gradual contraction of the joints of the trunk and of the limbs," so that his body was greatly deformed, and he became entirely helpless; for many years was bedridden. His general health remained good, and he died at about the age of sixty. It was impossible to employ any other receptacle for his interment than a box something like a packing-case, to hold his remains. The cause of his motor infirmity is not known. His last illness was an acute pulmonary disease.

D was a son, who married early and had five children. One of these is the subject of this communication. These children all grew to maturity, and with one exception are still living. D himself was of most excellent character, industrious and sober, and for many years presented no sign of stigmata of any kind. At about middle life, however, he gradually developed chronic chorea, which persisted throughout his remaining life and much impeded his activities, until, toward the end of his life, he was unable to do any kind of labor. The chorea was especially marked in the area of distribution of the seventh cranial nerves, and resulted in ataxia,

and later in essential paralysis of all the facial muscles. The upper eyelids drooped, and he was obliged to lift the lid with his finger in order to look forward or upward. His mouth was always open, and his teeth gradually fell out until all were gone. His face hung in loose folds, and his former expression of features was lost. He could not chew his food, and when his teeth were finally lost it was frequently difficult for him to take sufficient nourishment. His speech was thick and indistinct from lack of control of the muscles concerned in speaking. Swallowing was difficult on account of ataxia of the pharyngeal apparatus, and he often choked while eating and always in drinking. Visual and auditory functions were normal. The head was continually carried far forward from weakness of the nuchal muscles, and the back of the neck was disproportionately long. The muscles of the trunk were less affected; the arms were only partially under voluntary control. The patient always shaved himself, though to the onlooker it seemed as if he must cut his throat at each motion. The legs were fairly strong, and he could walk considerable distances without fatigue. The gait was alcoholic rather than ataxic. His bodily condition did not materially change during many years, though his mental powers became weakened with advancing age, and he became peevish and irritable to a marked degree, though not actually demented. Coincident with the mental changes was a gradual progressive emaciation in flesh; what his condition might have become, had he lived to a more advanced age, it is of course impossible to say. He died at the age of seventy-six of some pulmonary affection after a short illness. There is no history of endocarditis or of acute rheumatism in his case. The course of the choreic infirmity in this patient somewhat resembles that described by Osler ("Remarks on the Varieties of Chronic Chorea and a Report upon Two Families of the Hereditary Form, with One Autopsy," *Journal of Nervous and Mental Disease*, February, 1893), in which he reports several cases of this disease. The patient whose choreic infirmity is incidentally described in the present communication does not, however, afford an example of the progressive nature of the malady, as pictured by Professor Osler; and his condition did not apparently suffer any noticeable change for many years. His decline in physical and mental vigor may reasonably be ascribed to senile changes which might be expected to appear at an even earlier stage in a patient so long affected with a serious disorder of the important co-ordinative nervous centres.

The pathology of chorea is not clear, and not much apparent gain has been made in reference to its causation or seat or the nature of its anatomical lesions, if any. The theory of a toxic origin has not been proved. Heredity, or at least transmissibility, seems more probable, and that the inherited taint is not necessarily essentially choreic in character in the ancestor. Chorea is not

infrequently observed after the acute febrile infections, but is then usually of only transitory duration, and not chronic or progressive in character. If endocardial complications exist the course and progress of the disease may be dependent upon the nature and seat of the endocardial damage, and may or may not be of serious importance to the well-being of the patient in the future.

E was a daughter, and was well until about eighteen, when "some bone disease" developed, which was followed by deformity of the trunk (probably some carious affection of the spine). This healed after a time, and this person married and had three children, who were apparently normally developed, and seemed to be free from inherited taint. One of them, however, at about the age of eighteen, became the subject of obscure cerebral symptoms, which were followed by gradual impairment of the mental faculties, and led to a practically idiotic condition, and she died at about the age of thirty, almost an imbecile.

F was a son, who left home at about twenty and was never heard from later.

G was a daughter, who "was always very nervous," but did not develop special symptoms, so far as is known in the relationship. She died at an advanced age.

H was a daughter who was also "very nervous," but who developed no stigmata.

Of the second generation five members are known to have had offspring, numbering from one to eight. A short resume of these persons is appended.

A was blind and died in middle life without issue.

B had eight children, all of whom were strong and well until maturity, when several of them began to exhibit symptoms of the inherited stigma of disease. Five individuals of this family suffered from gradual impairment of vision, due to optic atrophy, which went on to total blindness in four, and in a fifth, sight was reduced to perception of light. One member was afflicted with some affection of the hip, which lasted for some years, and resulted in impairment of the joint and about two inches of shortening of the limb. Another suffered from mental trouble of melancholic type, and was under asylum care for a considerable time. She resided in a remote part of the country, and nearer information of her condition is lacking. All the female members of this family are neurasthenic, hysterical, and subject to constant fear of impending evil, which would seem to be grounded upon a justifiable state of reasonable apprehension of hereditary disease. Several of those who became blind have showed extension of the optic degeneration to the cerebral structures, with subsequent symptoms of softening, going on to slow impairment of the mental powers. None has presented signs of any acute meningeal complications.

C had three children, of whom one was dissolute and improvident,

and was considered weakminded. He died in middle life from some unknown cause. One of the others was the subject of "hip and spinal disease," was seriously deformed, weak mentally, and died in middle life, the cause of death given by the family being that "she went into a decline." The remaining member of this family was weakminded, hysterical, vain, improvident, and unreliable; she died from some unknown cause in middle life. Thus there was no surviving issue.

D had five children. All of these were of decidedly "nervous" temperament and occasionally exhibited indications of motor incoordination, suggestive of the choreic affection from which D (the father) suffered, but no member of this generation has developed the condition to an appreciable degree.

In the fourth generation from the original ancestor in this family, there have been about twenty members. Of these, about fifteen are believed to be living. Three infants of this line died from some affection attended with convulsions, and another became dissipated and a vagabond, and is believed to be dead.

The remaining members, so far as known, are all of "nervous" temperament, but have not as yet developed any special tendencies toward any of the affections from which the former generations have suffered. It would seem that the original taint has become attenuated by successive dilution with healthier stock, until the original infective element has become practically extinct. There has been one infantile death in the fifth generation from convulsions, but the circumstances attending this case are not definitely described.

The patient who forms the real subject of this communication is of the third generation, a lady now about sixty-five years of age. She was well as a child, and left home at about eighteen, to engage in mercantile occupations, and has remained in the same employment and position ever since that time. She has resided with the family during all these years, and though depleted by the death of nearly all its members, she and her employer have remained together. These two now constitute the entire household.

The patient began to notice her infirmity at about twenty-two years, when the attacks are described as suddenly appearing in the form of an irresistible inclination to fall asleep. She became subject to somnolence at all times of the day, without known cause or apparent provocation by surrounding circumstances. Otherwise she seemed to be in her usual health. One attack afforded no protection from a recurrence of the same character, and she has been known to have a succession of them during the whole of an entire day. She seems to fall into a perfectly natural slumber, and can easily be roused by a call or by any unusual noise. She awakens readily, and is apparently unaware that she has fallen asleep. At other times the sleep is more profound, and she realizes that she has passed an appreciable interval in unconsciousness. She is

never confused, or in any other way noticeable after the attack, and sleeps regularly at night, as other persons are accustomed to do. During a period of more than forty years the lady has suffered from this condition, without appreciable change in the character of the manifestations of the malady, though careful observers think that within ten years there has been a noticeable deterioration in her general mental condition; that she seems somewhat dull and has not her usual acute perception in matters in which she was formerly very accurate. It is now believed that she is suffering from diabetes, but of this I have no personal proof. Otherwise she seems as well as could be expected in a lady of her years; considering that she has constantly worked very hard at a taxing occupation, and has lost little time from illness, nor has she been accustomed to take time for relaxation or recreation. The attacks are now in no appreciable way different from those at first observed; and the mental decline may perhaps be due only to the approach of old age. Her figure is full and rather plump, her color is good considering her age, but is somewhat ashy in hue. Her appetite is good, her strength remains fairly good, but she feels "that she is not so strong as she was." For a time she "dieted," but now she "eats all she wants" without harm. She states that she has had a series of "diabetic ulcers" within the last few months, which have healed under mild treatment. Her sight has also become very weak, so that she can read only the largest print. This may be the result of long abuse of her eyes, or it may be simply another accompaniment of her age. There has been no pain or other acute symptom in her failing vision, and it may be connected with the diabetic (?) process. There is no history of acute rheumatism or endocarditis, nor of any other infective or constitutional disease. The thyroid is neither hypertrophied nor absent.¹

Almost nothing is known of the pathology of narcolepsy. The description of its causes, written by Aretæus, comprises nearly all that we know at present.² He states: "Multus somnus refrigerat et resolvit et stupefacit." And further on: "Somnus multus crassitudinem corporis et ignavium facit, et nebulam quandam sensibus offendit; medoieris autem prodest." (Aretæus Cappadocis, Causis et Signis Morborum. Johannes Wigan Oxaniæ: MDCCLXXXIII.) (See Latin translation.) Andreus Pizlerus, writing almost fifteen hundred years later, states essentially the same thing in the following: "Præsumptio ergo, spiritus in organa sensum minus influere, sed poris cerebri obstructis vel obrui, vel impediri quo minus commercium cum objectis extrinsecis exerceri et conceptus

¹ Since the above was written, the urine of this patient has been examined by an authority whom I respect, with the following result: Color, light amber; reaction, strongly acid; specific gravity, 1.012; sediment, very slight; albumin, very large trace, by three tests; reaction for sugar (glucose) gave absolute negative result. A confirmatory examination of the urine by another authority gave the same qualitative results.

² The contemporary of Galen, born A.D. 131, died near the end of that century.

ideales ut prius formari possint." (*Dissertatio Medica de Affectionibus Soporosis et Catalepsi*, a Andrea Pizlero, Jenae, MDCCVIII.) He also quotes Horace (*Satirum sive Sermonum*, Lib. iii, v. 145 et seq.): "Quondam lethargo grandi est oppressus," etc.

Porter states that "it is not the length, but the character of the sleep and the associated symptoms that make narcolepsy a distinct disease."

Putzel, in a recent work on *Functional Nervous Diseases*, classes narcolepsy under the heading of "epileptoid sleep states," and remarks that "it is very probable that narcolepsy will find its appropriate place among the minor epilepsies, and occupy the borderland between the epileptic and the non-epileptic conditions." . . . "The narcolepsies in a general way are recognized not from their character, which is that of true sleep, but from the frequency of the attacks, suddenness of onset, and their irresistible nature."

Finally, a pathological form of sleep, or at least a slumberous condition, may be produced by some affections, or probably rather, infections, accompanied by recognizable lesions of the nervous system. Among other possible causes, it is now generally accepted that the invasion of the body by the parasite of trypanosomiasis is the potent causative agent of the series of progressive symptoms, which uniformly persist and usually lead to the development of that inevitably fatal disease, called for want of a better name, the "sleeping sickness."

The theory that narcolepsy is caused by some toxic action within the system, either of autogenous or extraneous origin, seems to be supported to some extent by the rather frequent reported association of the narcoleptic condition with diabetes or obesity, which latter are usually only observed at a much later period than the morbid inclination to sleep. It may be that its association with these two conditions is only accidental, or that the same causative action (possibly of metabolic character, or related to some chronic nervous impairment), may produce both the narcolepsy and later the symptoms of diabetes or of obesity. This would correspond with the known production of diabetes experimentally by traumatic injury of certain parts of the central nervous system. No definite information upon this correlation of symptoms in narcolepsy is yet available. The pathology of the affection is still shrouded in obscurity.

The treatment of the nervous phenomena has been much simplified since we have realized that nothing is definitely known of the causation of the symptoms. In the thesis of Pizler, to which reference has been made above, the treatment advised was sufficiently active if not efficient. He recommends cupping, leeches, venesection, irritant clysters, emetics, purgatives, even the moxa, with irritative applications to the hands, feet, and body, etc.

The modern conception of narcolepsy has gradually resulted in the abandonment of most of the remedial treatment formerly

employed, until at present it consists almost entirely only of measures adapted to the hygienic and moral condition of the patient. If diabetic symptoms are detected they may be ameliorated by suitable diet and other treatment as indicated, and in some cases favorable results seem to have followed their exhibition; but no treatment thus far advised has seemed to effect any appreciable result (with one or two reported exceptions) in the direction of relieving the somnolency or in restoring the patient to a normal condition.

If this case be accepted as one of so-called "narcolepsy" (which, after all, is only one of the prominent symptoms of the disorder), as described by the authorities quoted above (and to my mind there can be no hesitation in so considering it), this affords some support to the theory of the "toxic" or "hereditary" or "transmissible" character of this obscure condition. The facts which would seem to support this theory date back to the third generation, antecedent to this patient, to a direct ancestor who was afflicted (according to the belief of trustworthy relatives) with an acquired infection of specific character which is known to be transmissible to posterity. The direct progeny of this ancestor, so far as known, all suffered from stigmata referable to direct inheritance, but not in the same way as that in which the original patient was affected. In all the direct offspring the disease appeared in the form of affections of the nervous system, with a strong predilection for the special senses. Some of the members of this generation suffered from degenerative changes in the special nerves of sight; some with troubles of irritative or cortical character; and some with affections of the co-ordinative or convulsive centres or distributions.

The results in the third generation are most appalling. Here were four members of one family stricken with blindness; four others were affected with organic or functional diseases of varying character, all referable to instability of the nervous system, and all tending to progressive degradation of the higher cerebral functions. In another line of the direct offspring the taint is observed in a convulsive form, impairing the motor functions, with terminal degeneration of the higher nerve centres. In still another the form is of a spastic character, lasting many years, but progressing to a final decay of the central intellectual functions. In short, each member of this unfortunate generation bore an inheritance of disease and death.

The condition called "narcolepsy" appeared in a member of the third generation, whose father was affected with chronic chorea. In another descendant of this father is found a series of deaths from infantile convulsions, and this tendency is transmitted in this line to the fifth generation from the original ancestor. Such an array of facts seems much more than a mere simple coincidence; and it appears rational to believe that this appalling history is a record

of the results of one original acquired constitutional infection, appearing in a rather long line of cases, illustrating the varying forms which it may take. But the most striking fact is this, that in each member of this considerable number of individuals the transmission is in the form of some affection of the nervous system, leading by direct extension to further degenerative changes in higher and more important nervous machinery.

Another fact is also striking: that the inherited taint in the members who survived childhood appeared only after full maturity. This is noticed in relation to chronic chorea by Osler, who reports, as above mentioned, several cases of adult chronic chorea; but most of these cases progressed by a rather rapid course to terminal dementia. On one of these he was able to secure an autopsy, the results of which, however, did not essentially assist in defining the seat or the character of the supposed nervous lesion to which the disease is thought to be due. Aside from the careful clinical observations which have been made in the last few years no essential progress has been accomplished in relation to this obscure disease. Of its "Wesen" we are as ignorant as ever. It is not more remarkable that from the choreic father a daughter should develop narcolepsy than that her father should have developed chorea from an inherited constitutional taint which was not similar in his own father.

The pathology of narcolepsy is rendered more obscure, and the seat of the lesion to which it is supposedly due is more difficult to determine, from the fact that the disease is not often fatal, the death of those affected with it being more generally long delayed and due often to other and independent causes, such as diabetes or its consequences. In most of the cases reported the patients have either been lost sight of or have lived many years, finally succumbing to maladies unconnected with the nervous disorder. In chronic chorea, when the disease follows the course depicted by Osler, and the case progresses to terminal dementia, with the practical obliterations of all the mental faculties and functions, there may well occur a variety of histological changes in the more important higher centres which would be misleading. In the case of chronic chorea included incidentally in this communication the motor symptoms were for many years practically stationary in their manifestations, and the gradual deterioration of physical and mental vigor in the patient may reasonably be assigned rather to advancing senility than to the choreic degeneration with imbecility, described by Professor Osler. The patient died at a greater age than most individuals attain, and except for the infirmities connected with his disability and the difficulties sustained in his nutrition, owing to impaired deglutition for many years, he was as comfortable as most old people until nearly the end of his life. Unfortunately no autopsy could be obtained.

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AN UNUSUAL CASE OF ANTITOXIN RASH.

BY RAY LYMAN WILBUR, M.D.,

STANFORD UNIVERSITY, CALIFORNIA.

THE patient, who was the subject of the condition described in this note, is an American woman about thirty-five years of age, whose maternal grandmother was of Spanish blood. During childhood she was an asthmatic, and since reaching maturity she often has had attacks of hay fever. She also gives a history of occasional urticarias following the ingestion of strawberries or shellfish.

Because of the illness of her daughter with diphtheria, she was given by me, at her home in the country, a prophylactic injection of a thousand units of antitoxin. There was no nervous shock from the injection, the patient walking immediately afterward into another room. In about four minutes she called me, complaining that she did not know what was the matter with her head and face—the head felt so full and the face so flushed. Following this in rapid succession came total hyperemia of the skin, with terrific itching and the development of immense white weals. Then the lips, tongue, and eyelids began to swell and the patient complained bitterly that she could not breathe, that she was going to die, that her heart was thumping against her chest so hard that it pained her. The pulse, which was at first very rapid, soon became imperceptible at the wrist, although the apex-beat was very vigorous. It was only by much encouragement and great will-power and the use of stimulants that consciousness was retained. The heart-beats soon became irregular and less vigorous, the pulse weak and thready, or imperceptible, and the face now became a peculiar ashen gray. The color faded from the neck and chest, but the limbs and abdomen were still intensely hyperemic and covered with weals, and itched intensely. Following the first period of partial collapse a typical severe asthmatic attack came on which produced still greater difficulty in breathing and was accompanied by the usual sounds in the chest. This lasted for a short time, the pulse improving meanwhile, but was succeeded by a second sudden flushing of the face followed again by the peculiar ashen appearance of the face, and disappearance of the radial pulse. The patient retained consciousness, but felt sure that she was dying. She maintained control over herself admirably and fought against the sensation of impending death. With the administration of hot black coffee the heart action improved and she felt temporarily better. She then began to complain again of the tongue and lips swelling and felt as if she could not draw air through the larynx. Air was drawn into the chest with great difficulty, but the signs of asthma were absent, and the

whistling sounds accompanying respiration seemed to come entirely from the larynx. An œdema of the larynx was diagnosed. For a time the condition grew steadily worse, the patient became cyanosed, the breathing very labored, and the laryngeal sound loud and terrifying. When a hurried tracheotomy seemed inevitable she began gradually to improve and her respiratory and cardiac symptoms largely disappeared. The rash came out on the face again, and within one hour after the injection she was able to be moved to her room and put to bed. During the attack she had been unable to lie down and had to be held in a sitting position before an open window. For the next thirty-six hours the patient was in great anguish from the intense itching and burning of the skin over the whole body. The pulse remained about one hundred to the minute, but there was no rise of temperature. The rash then rapidly subsided, and except for a few scattered weals and some joint stiffness she soon regained her normal condition of health.

In considering the case it is interesting to note that her sister, who was given a similar injection later in the same evening of the same kind of antitoxin, had no rash for six days, and then a rather severe one lasting for thirty-six hours and followed by some joint-pains. Her four-year-old niece, a child of her brother's, had irregularity of heart action and drowsiness following the injection, but only a moderate rash six days later. Her daughter, the diphtheria patient, received fourteen thousand units in all and had no disturbance from the antitoxin until eight days after the last injection, and then a rather severe scarlatinal-like eruption accompanied by a low fever, of two days' duration, then a two days' lull and a second eruption, with temperature up to 102° and a high heart rate. It is of importance to note that all of these patients had a certain percentage of Spanish blood in their veins, and that they all had some form of rash, although a number of other relatives by marriage and exposed children had injections at the same time, and none of them developed rashes.

The striking feature of the case is the sudden onset and the severity of the symptoms. The circulatory disturbances seemed to be due to a sudden intense vasomotor dilatation in the skin and mucous membranes, with the inability, for the time being, of the heart to receive enough blood for circulation, hence its rapid, forcible, inefficient beating. Its suddenness leads one to suppose that the effect of the injected element causing the rash may have been upon the central nervous system—the vasomotor centres—producing, perhaps, a peripheral vasomotor paralysis. The mucous membranes seemed to be similarly affected and to undergo a certain amount of temporary œdema. Probably to this was due the asthmatic symptoms. There is no history of angioneurotic œdema or of œdema following bee-stings or insect-bites given by the patient.

Two weeks previously the patient had ether administered for

tonsillectomy; a hypodermic injection of morphine and atropine given at that time raised a weal at the site of injection. Whether any after-effects of ether on the liver or nervous system played a part in this peculiar action of the antitoxin is a question.

The emergency treatment used was that at hand. She was given immediately strychnine sulphate 1.20 grain by the mouth. This was followed by numerous small cups of hot black coffee, given at frequent intervals. Six drachms of Epsom salts in hot water was given early and a high large soap-suds enema was given and repeated shortly after. One and a half hours after administration of the antitoxin vomiting occurred, with considerable relief. Within two or three hours the bowels were acting vigorously. Alkaline sponge baths were given constantly, and milk of magnesia, a tablespoonful every three hours, was administered internally. Locally, some relief was obtained from a 5 per cent. solution of carbolic acid in milk of magnesia. The next two days sodium carbonate tub-baths temporarily relieved the intense itching. The most relief was obtained from the use of a spray consisting of: menthol 2 drachms, and ether, chloroform, and spirit of camphor each 6 drachms; followed by the use of a powder consisting of: powdered camphor 1 drachm, powdered zinc oxide 3 drachms, and powdered starch 1 ounce. The second day following the injection was made tolerable by the use of veronal and heroin as sedatives and by the administration of one teaspoonful every four hours of the following mixture: magnesium sulphate and calcium chloride each 4 drachms, chloroform-water 1 ounce, tincture of orange-peel 1 ounce, distilled water sufficient to make 3 ounces. On the third day, except for swollen eyelids, coated tongue, anorexia, joint pains, and some rash, the patient was practically over the experience. She has since been quite well.

REVIEWS.

A TREATISE ON DIAGNOSTIC METHODS OF EXAMINATION. BY HERMAN SAHLI, Director of the Medical Clinic, University of Bern. Edited, with additions, by FRANCIS P. KINNICUTT, M.D., Professor of Clinical Medicine, Columbia University, and NATHANIEL BOWDITCH POTTER, M.D., Visiting Physician to the City Hospital, New York. Authorized translation from the fourth revised and enlarged German edition. Philadelphia and London: W. B. Saunders & Co., 1905.

PERHAPS the most complete and exhaustive work on diagnosis and diagnostic means is the American translation of this great teacher's work. Probably no American or English work on this subject is so up-to-date and accurately descriptive, and certainly no similar book anywhere can claim, as does Sahli's, that it is the result of years of one man's observations and adaptations and not, like our standard diagnostic works, a mere compilation.

History taking and general considerations derived from first impressions of the patient form the opening chapter. The more striking local manifestations of many diseases are here considered, as, for instance, oedema of the skin, its theory of causation, collateral circulation, the striking exanthemata (an excellent picture of the typhoid roseola).

A fuller reference to the obscure fevers would have improved the notes on temperature, while eleven types of dyspnoea suggest a refinement in differentiation not often met.

Pulse and blood pressure, the next subjects considered, can scarcely be excelled in description. The latter is taken up technically and practically. The former includes a discourse on venous pulsation, which will make clear this difficult corner in diagnosis to any who will read.

The explanation of the phenomena of percussion, the theory and practice thereof, far exceeds one's expectations, and has been made by historical references an attractive section, and the scheme and description of the pleuropericardial rub is novel and interesting. The condition of heart-block is given consideration and valvular heart lesions are lucidly explained. Why abdominal inspection should be inserted in the middle of the heart's description is not evident.

As might be expected it is the section on diagnosis of gastric disorders that is most eagerly sought, and no disappointment is experienced. Fuller by far than any other work, with chemistry for the chemist, practical points for the practical, it gives one a new conception of investigation and diagnosis of gastric functions. Particularly interesting is the new butyrometric test for absorption.

The examination of the rectum is given in a special place, but it appears incomplete without mention of the conditions found by rectal examination in appendicitis.

Very practical is the consideration of the gross appearance of the feces; very careful the description of quantitative estimations of waste products and undigested or unabsorbed food matters. The intestinal parasites are fully reviewed, the new world hook-worm being given mention.

We can recommend the chapter on examination of the urine to any student's or worker's investigation; especially fine is the discussion upon nuclealbumins, serum albumins, albumose (an excellent table of differentiating reactions of albumins and albumoses is appended). A table of reducing substances present in the urine adds to the pages on glycosuria. Cryoscopy, electrical conductivity are described, and the chemistry of total nitrogen and the waste products, so much studied at present, is carefully gone into.

Sputum and clinical bacteriology are serviceably considered. The plates are not particularly good or instructive.

We cannot be enthusiastic about that part of the book given over to the blood and its diseases. The plates are poor and wrongly lettered. Undue credit is given Koch with regard to malaria. Trypanosomiasis is not mentioned.

Special chapters on the mouth and tongue, with good plates and a first-rate resume of the results of cytodiagnosis, are among the additions by the American authors; the x-ray chapter is their work as well.

The nervous system required two hundred pages for its investigation, and is complete to a degree. Many new schemes and diagrams are introduced. One should particularly mention those describing the reflexes and the systems controlling the bladder and rectum. Most of the pictures seem to be from the American clinics.

An addendum to general diagnosis, including further work on the pulse tracings, etc., follows the chapters on the nervous system, and concludes the book.

With regard to the arrangement of the book one can say that perhaps the somewhat indiscriminate grouping observed is rather confusing when searching for a particular subject. Bacteriology, for instance, suffers by being appended here and there in different sections.

N. B. G.

A TEXT-BOOK OF PHARMACOLOGY AND THERAPEUTICS, OR THE ACTION OF DRUGS IN HEALTH AND DISEASE. By A. R. CUSHNY, M.D., Professor of Pharmacology, University College, London. Fourth edition. Philadelphia and New York: Lea Brothers & Co., 1906.

THE need for a new edition of this work having arisen through the appearance of the eighth decennial issue of the United States Pharmacopœia, the author seized the opportunity to include in the new edition the advances made in pharmacology during the last few years. Those who are already familiar with the quality of Dr. Cushny's work will welcome the new edition without any special introduction. The changes that have been made do not affect the general plan of the book, and the classification of drugs adopted in previous editions has been retained. Considering the long list of new drugs that claim the attention of systematic writers every year, it is remarkable that the author has succeeded in keeping this volume within reasonable dimensions without omitting to mention the most important additions to the Pharmacopœia. The discussion of purely pharmacological questions, with few exceptions, deals with the information gained through experimentation rather than with the experiments themselves and with conflicting theories; this avoidance of lengthy and tedious reports of experiments keeps the book within the scope of students and practical doctors. The opinions advocated on questions that are still under discussion do not call for special remark, and it does not appear that the last few years have been productive of any important final decisions on moot points, such as the food value of alcohol and the like. One might wish that the author had been a little more emphatic on the subject of antipyretics and the dangers attending their use; for it is unfortunately a fact that many practitioners still fail to realize the dangers which have recently given rise to so much agitation both in the medical and in the lay press. It is true that the practice of prescribing coal-tar derivatives in the treatment of fevers is "deprecated," and a general warning is uttered as to their dangers in neuralgia and headache; but one seems to read between the lines that the present agitation in the author's opinion is somewhat overdone. Brief consideration is given in Part V to ferments, secretions, and toxalbumins. The ferments are disposed of in a very few pages, which are chiefly devoted to their physiological aspect, as the author is evidently convinced of their absolute uselessness in practical medicine. Under the head of internal secretions thyroid gland extract, or rather iodothyryn, receives full consideration. Other internal secretions, such as extracts of the pituitary, the thymus gland, etc., are dismissed with a few words. Suprarenal gland preparations are discussed under the head of circulatory stimulants.

On the whole the pharmacological part of the book completely overshadows the therapeutic portion, which is limited to a bald statement of the various preparations of drugs and a few general indications for their use. Administration is not discussed at all, and there is nothing to tell the reader which preparation he ought to select in a given case. The difficulty is very often not what drug to use, but in what form, in how large a dose, and at what intervals. These subjects are only treated in the most general way in the introduction or in occasional passages hidden away in the text.

Each article is provided with a bibliography which the student will find exceedingly helpful. The book is also supplied with a list of drugs classified according to their therapeutic use and a very good index.

R. M. G.

A TREATISE ON THE NERVOUS DISEASES OF CHILDREN. FOR PHYSICIANS AND STUDENTS. By B. SACHS, M.D., Alienist and Neurologist to Bellevue Hospital; Neurologist to the Mt. Sinai Hospital; Consulting Physician to Manhattan State Hospital, New York. Second edition, revised. New York: William Wood & Co., 1905.

THE first edition of Dr. Sachs's well-known treatise was so carefully written and covered the subject so completely that little opportunity was left for improvement after the ten years that have elapsed since the book was given to the profession. The most noticeable change has been the condensation of the text from 656 to 557 pages. This has been accomplished by omitting the bibliography at the end of each chapter and by omitting the chapters on the anatomy, physiology, and pathology of the spinal cord, on the anatomy and physiology of the brain, and on anaemia and hyperaemia of the spinal cord, and the appendix on therapeutic suggestions.

The consideration of anaemia and hyperaemia of the spinal cord has long appeared in formal text-books on neurology, with more or less open apology for their inclusion as distinct diseases. It is therefore a step in advance that Dr. Sachs has at last refused to follow the custom which is continued in later text-books simply because the older writers labored to describe definite symptoms due to varying states of the blood supply of the spinal cord. With the exception of the direct effects of concussion upon the cord and its membranes, which are usually discussed under this special heading, the condition of anaemia and hyperaemia is best considered in association with other morbid states and more important clinical

symptoms, as Sachs pointed out in his chapter on the subject in the first edition of his work.

The reasons for the omission of the valuable chapters on anatomy and physiology are less obvious; and as the original volume was not overcrowded, it seems to us a mistake to have sacrificed them simply for the sake of condensation, and because, as the author states in his preface, the subject matter can be found in other text-books.

The additions are not numerous—a few lines here and there ingeniously fitted into the original plates, some larger additions at the end of each chapter, a few new illustrations, and a section on amaurotic family idiocy, which was not discussed in the first edition. In saying this, however, we in nowise wish to detract from the value of the second edition. It simply serves to emphasize the fact that the author found little to improve or change in an already nearly perfect work, which has been honored by translation into German, Italian, and French, and will continue for a long time to come to be quoted as the standard text-book upon this important and little specialized division of pediatric medicine.

T. S. W.

THE PRACTICE OF MEDICINE. A TEXT-BOOK FOR PRACTITIONERS AND STUDENTS, WITH SPECIAL REFERENCE TO DIAGNOSIS AND TREATMENT. BY JAMES TYSON, M.D., Professor of Medicine in the University of Pennsylvania and Physician to the Hospital of the University; Physician to the Pennsylvania Hospital; Fellow of the College of Physicians of Philadelphia; Member of the Association of American Physicians, etc. Philadelphia: P. Blakiston's Son & Co., 1906.

THE fact that the fourth edition of this book has appeared only two years after the third edition indicates that its merits have been recognized by the profession. The main change in this edition has been in the rewriting of the section on animal parasites by Prof. Allen J. Smith, who is recognized as an authority on this subject. The section has been improved by the addition of a number of illustrations, and the contents are of such a nature that a comprehensive knowledge may be obtained of animal parasites not only from a medical but also from a biological point of view.

One of the most pleasing features of the work is to be found in the historical sketches of a number of the diseases; this adds considerably to the interest of the reader. Another commendable point is the use of italics in emphasizing important or distinctive features, or especially reliable methods of treatment. This should

aid the student materially in grasping the essentials from among the mass of details which must of necessity be included. The discussion of each phase of each subject is sufficiently full; and being interspersed with the opinions and reports of various authorities and investigators, the matter presented is complete. The personal views and experiences of the author are frequently and fully given, and in the case of Prof. Tyson are of decided weight; as his opportunities for the clinical study of disease have been exceptional, and his painstaking, careful methods make his observations of distinct value. Numerous references are given in foot-notes, so that the original publications from which facts have been extracted may be consulted.

Still another particular that makes this volume of more value and adds to its convenience is the fact that there are included in it descriptions of the technique of the more commonly used methods of clinical diagnosis. There are instructions in the methods of examining sputum for the tubercle bacillus, for staining blood, and for examining blood for the plasmodium of malaria. There are also descriptions of the tests for determining the character of the gastric juice and the urine.

While some of the most recently advanced theories regarding the nature and treatment of certain forms of disease have been omitted it may have been decided by the author that these are supported as yet by too little proof.

The book contains a good index, and is on the whole one that will be found complete and satisfactory as a book of reference, and excellent as a text-book.

F. W. S.

COUNSELS AND IDEALS FROM WRITINGS OF WILLIAM OSLER, M.D.
Boston and New York: Houghton, Mifflin & Co., 1905.

DR. CAMAC, with what might be termed an excess of modesty, has refrained from placing his name upon the title page of this most admirable little collection of wise laws and modern instances, drawn from the writings of the man who holds the most commanding position in the English speaking medical profession at the present time. We may be allowed however, to congratulate the compiler on the great skill which he has manifested in the selections which he has chosen, and in his arrangement of them. Dr. Osler has written and spoken on most of the subjects with which the life of the medical man is brought in touch, and we may be sure that everything that he has let fall possesses a peculiar value. It is only necessary to glance at the titles of the forty-seven

articles from which this book has been derived to see what a wide field Dr. Osler has covered, and to what varied audiences he has spoken. The book is a collection of good things, and it is, therefore, impossible to single out individual portions of it for special mention. There are twenty sections, and the topics dealt with comprehend the entire philosophy of life. It is sincerely to be hoped that the work will obtain a wide circle of readers without the pale of the medical profession. Dr. Osler is much more than a physician, he is a philosopher, and a practical man of affairs, and there are few who could not read this book and derive from it lessons which would be of benefit to them in their daily life. Most physicians have already read its contents, as they have appeared in current medical literature, and no doubt many have wished that they could be put in just some such permanent form as has been done by Dr. Camac. To him we feel, therefore, under a special debt of gratitude.

F. R. P.

LES TACHES DE KOPLIK; LEUR IMPORTANCE POUR LE DIAGNOSTIQUE ET LA PROPHYLAXIE DE LA ROUGEOLE. PAR ANDRÉ BING, Docteur en Médecine, Licencié es Sciences. Paris: G. Jacques, éditeur, 1905. New York: Paul B. Hoeber.

THE recognition of the value of Koplik's spots as a pathognomonic early symptom of measles has become so universal in America that the appearance of the present monograph at first sight seems a trifle behind time; but even a cursory perusal of its pages suffices to convince one that the author has presented for his own countrymen an exhaustive study of the subject and has discussed the essential characteristics of this sign so lucidly that every French physician into whose hands this monograph may fall can have no just excuse for confusing this lesion with other morbid appearances of the oral mucous membrane.

Such a study by a French writer is all the more of value since little attention seems to have been given to the subject in France, and the few French authors who have referred to it at all, among whom are Gillet, Guinon, Marévéry, Renault, Serinelli, and Roger, speak of the bluish-white point as being from 2 to 6 mm. in diameter, when in reality it is only a few tenths of a millimetre. The claims of priority made by friends of Flindt, Filatow, and Bielski are convincingly refuted, and the honor of the discovery and adequate appreciation of the value of this sign is justly conceded to Dr. Koplik.

The present monograph, which covers fully 194 octavo pages, including a bibliography of 234 references, must be accepted as a complete exposition of all that can be written up to the present about this interesting sign, and constitutes a deserved memorial to the fame of its discoverer.

F. S. W.

THE PATHOLOGY OF THE EYE. By J. HERBERT PARSONS, B.S. D.Sc. (LOND.), F.R.C.S. (ENG.), Assistant Ophthalmic Surgeon, University College Hospital; Assistant Surgeon, Royal London (Moorfields) Ophthalmic Hospital; Ophthalmic Surgeon, Hospital for Sick Children, Great Ormond Street. Vol. II. Histology. Part II. New York: G. P. Putnam's Sons. London: Hodder & Stoughton, 1905.

THE second volume of Parsons' *Pathology of the Eye* completes the subject begun in the first, taking up in succession the lens, vitreous, choroid, retina, optic nerve, orbit, and lacrymal apparatus. It exhibits the same excellent characteristics as the preceding volume. Like it, it is exhaustive in its consideration in turn of the various disease forms to which the ocular structures are subject. A bibliography of the most important contributions is appended to each subject.

It will no doubt remain for many years the standard work upon the subject with which it deals. It is difficult to see how it can be replaced until the whole subject of ocular pathology will have to be rewritten as the standpoint changes from which the science is reviewed.

T. B. S.

THE CHANGES PRODUCED BY INFLAMMATION IN THE CONJUNCTIVA (HUNTERIAN LECTURES, ROYAL COLLEGE OF SURGEONS, 1905). By M. S. MAYOU, F.R.C.S., Jacksonian Prizeman and Hunterian Professor, Royal College of Surgeons, Eng.; Ophthalmic Surgeon to the Hospital for Paralysis and Epilepsy, Maida Vale. London: John Bale, Sons & Danielsson, Limited, 1905.

THIS excellent monograph belongs to a class of books which are only too few, for it is not simply a compilation but gives the fruitful results of original research. It contains part of the book which obtained the Jacksonian prize in 1903. That part of the book which is most original relates to studies upon the microscopic structures of the normal and the diseased conjunctiva and the effect of the x-rays upon it. The clinical descriptions of the diseases are of course common property, which is also true of most methods of treatment, etc.

In connection with trachoma, the author details his experience with the x-ray treatment, which method he was the first to introduce, finding no serious effect upon the globe or other structures under x-ray treatment of rodent ulcer and lupus of the eyelid. The granules disappear very rapidly under x-rays; the same result

can be attained by operative methods which have the additional advantage of removing the diseased tissue, but many patients are averse to undergoing any operation. No mask is necessary; the upper lid is everted and the lower lid pushed up so as to cover as much of the cornea as possible, but in severe cases of pannus the cornea is left exposed. A few weeks of treatment cause the granules to disappear, leaving a supple, non-contracted, non-scarred conjunctiva—certainly a great improvement over the cicatrices produced by other methods.

Pannus, especially if recent, often clears with great rapidity, the patient noticing improvement from almost the first exposure; but even dense opacity will often clear considerably. Recent cases, subacute and chronic, naturally yield the best results.

The author sums up the chief advantages and disadvantages of this treatment as follows: (1) Considerably less deformity of the lid after treatment. (2) Painlessness. (3) Pannus clears more thoroughly. The chief disadvantages are: (1) All patients do not react well to x-rays. (2) Difficulty of deciding when to cease treatment.

In the periods of rest between the exposures to the x-rays the application of copper is very useful, but care must be used as the reaction produced by it is intensified by the previous application of the x-rays.

T. B. S.

PROGRESSIVE MEDICINE. A Quarterly Digest of Advances, Discoveries, and Improvements in the Medical and Surgical Sciences. Edited by H. A. HARE, M.D., Professor of Therapeutics and Materia Medica in the Jefferson Medical College of Philadelphia, etc. Assisted by H. R. M. LANDIS, M.D. Vol. I., March, 1906. Pp. 304. Philadelphia: Lea Brothers & Co.

THE subjects considered in this volume are: (1) The Surgery of the Head, Neck, and Thorax, by Charles H. Frazier, M.D. (2) Infectious Diseases, including Acute Rheumatism, Croupous Pneumonia, and Influenza, by Robert B. Preble, M.D. (3) The Diseases of Children, by Floyd M. Crandall, M.D. (4) Rhinology and Laryngology, by D. Braden Kyle, M.D. (5) Otology, by B. Alexander Randall, M.D.

These subjects seem to be adequately covered, the various papers reviewed being interpolated by critical remarks by the reviewers. It is satisfying to note the increasing number and high quality of the contributions to the surgery of the cranial contents.

The section upon suture of heart wounds contains a summary of the reported cases to date. The literature quoted upon infectious diseases shows that most of the articles during the year were

confined to clinical studies and case reports. The reports of the typhoid and pneumonia commissions are abstracted, and under scarlet fever attention is called to the opinion of several workers that the protozoan bodies described by Mallory in 1904 cannot be considered as the cause of this disease.

In the section on Diseases of Children infant foods and feeding occupy the usual prominent place, and the interesting researches by Clark, Taylor, and Prout upon "Brachial Birth Palsy," published in this JOURNAL, October, 1905, is abstracted.

Laryngology, Rhinology, and Otology contain a number of interesting abstracts. The value of such a volume as this is considerable, because though the abstracted papers are necessarily presented briefly, the reader is enabled to ascertain what various research and clinical workers are doing along the lines of progressive medicine.

OLIVER WENDELL HOLMES AND THE CONTAGIOUSNESS OF PUERPERAL FEVER. BY CHARLES J. CULLINGWORTH, M.D., F.R.C.P.
London: Henry J. Glazier, 1906.

WE are sincerely glad that Dr. Cullingworth has seen fit to republish in such an attractive form this interesting address. It must be a subject of congratulation to the American medical profession to find so eminent an Englishman attributing its proper weight to the labors of his American brother. The essay is accompanied by a very short and interesting bibliography of the subject, and by an interesting portrait of Dr. Holmes, taken from a daguerreotype made shortly after the first publication of his work on the subject of "Puerperal Fever." F. R. P.

THE WORLD'S ANATOMISTS. BY G. W. H. KEMPER, M.D.
Philadelphia: P. Blakiston's Son & Co.

THIS little paper-bound volume is a cleverly compiled series of very condensed biographies of the most prominent anatomists who have flourished in all ages of the world's history. It includes the living as well as the dead, and it contains many portraits and some reprints of old anatomical illustrations. In such a work there are of course some omissions, and there are also some names included which might hardly seem necessary. Taken as a whole, however, the author deserves to be commended with the way in which he has performed his labor. F. R. P.

METHODS OF ORGANIC ANALYSIS. By HENRY C. SHERMAN, PH.D.,
Adjunct Professor of Analytical Chemistry in Columbia Uni-
versity. New York: The MacMillan Co., 1905.

THE book is designed to give a connected introductory training in organic analysis, and as it is largely devoted to quantitative methods for analysis of food materials and related substances, it should be found of use to those working in the sciences allied to medicine. A knowledge of inorganic quantitative analysis, elementary organic chemistry, and general analysis is presupposed. The analysis of carbohydrates, acids, oils, fats, butter, milk, proteids, and cereals are among the substances discussed. As a rule, a number of methods are given for the analysis of each substance, and the directions are thorough and clear. The book is well arranged, and the literature is extensively referred to by foot-notes and brief bibliographies at the end of chapters. G. C. R.

AERZTLICHE TAKTIK. By DR. FRITZ SCHLESINGER. Berlin:
S. Karger, 1906.

A COLLECTION of short essays on the practical side of professional life in the form of letters to a young physician, who, it appears, has complained to the author of the unfair concentration of practice in the hands of a few specialists and the spread of quackery. "Medical tactics" is defined as the art of winning and keeping the confidence of one's patients, which is to be attained by steadfastly bearing in mind the only legitimate object of all medical effort—the patient's welfare. The author displays a lofty sense of the duties and responsibilities of the physician and insists that sound medical knowledge, and skill born of thorough training, are indispensable to success, and that their deficiency cannot be supplied by mere superficial cleverness and "manner." Every general practitioner should make himself proficient in at least one specialty, although he need not proclaim the fact to the world. A sense of mastery in a particular field will add to the enjoyment of his work and save him from the humiliating role of a mere advisor to his patients in their selection of a specialist. As the essays deal with questions that confront practitioners of medicine the world over, their enjoyment requires no mental readjustment to foreign conditions of life, and the easy conversational style should recommend them as a pleasant relief from the heavier scientific reading to those who wish to keep up their German. R. M. G.

THE ANATOMY AND LIFE HISTORY OF ANKYLOSTOMA DUODENALE.
A Monograph by A. LOOSS, PH.D. Translated from the original
German manuscript by MATILDA BERNARD. Records of the
Egyptian Government School of Medicine, No. III. Edited by
the Director. Cairo: National Printing Department, 1905.

THE monograph embodies the first part of a series of studies upon ankylostoma, and deals exclusively with the anatomy of the adult parasite. After some discussion as to the history of the nomenclature, Looss determines upon the generic name *Ankylostoma* as the correct one, though he thinks it "abominable." The work is most exhaustive. To a description of the anatomy of the worm 143 folio pages are devoted, and eleven exquisite lithographic plates depict the structure of the parasite. There remains nothing to be said upon the subject, and as nearly as possible the author has made his work a finished study. An interesting observation is that the worm feeds solely upon the mucous membrane and submucosa of the intestinal tract, and not upon the blood of the host. If small vessels and capillaries are opened it is by accident. The monograph is a completed study. W. T. L.

TRAITEMENT DE LA LEPRE PAR LE PALETUVIER, OU MANGLIER ROUGE. Par le Docteur MATIAS DUQUE, Directeur et Médecin de l'Hôpital de Syphilis et Maladies Vénériennes, San Antonio. Pp. 146. Paris: Edmond Dubois et Cie, 1905.

THIS book presents the results of the author's experience in the use of extracts prepared from the bark of the mangrove tree, which he believes to be specific in the early stages of leprosy. All patients are cured in from ten to twelve months. In the second stage, when the viscera are not yet invaded, 60 per cent. are cured within three to five years; the remainder present a more or less appreciable relief. In the third stage, when the entire organism is invaded and the viscera and nervous system are seriously affected, there is only a more or less appreciable amelioration. The neurites and neurotrophic disorders are not affected, but the diarrhoeas and fevers are lessened, the appetite reappears, and the body weight increases. The evident accuracy of the detailed histories and the sincerity of purpose of the author should be rewarded by a trial of this remedy by those whose opportunities bring them in contact with patients suffering from this ill-omened disease. R. W. W.

PROGRESS
OF
MEDICAL SCIENCE.

MEDICINE.

UNDER THE CHARGE OF

WILLIAM OSLER, M.D.,

REGIUS PROFESSOR OF MEDICINE, OXFORD UNIVERSITY, ENGLAND,

AND

W. S. THAYER, M.D.,

PROFESSOR OF CLINICAL MEDICINE, JOHNS HOPKINS UNIVERSITY, BALTIMORE, MARYLAND.

Human and Animal Trypanosomiasis.—In December, 1904, Robert Koch was sent by the German government to East Africa to study the coast fever of cattle. His opportunities led him to make observations in other diseases as well and his work is condensed in a preliminary report appearing in the *Deutsch. med. Woch.*, 1905, xxxi., 1865.

The relapsing fever of East Africa differs very little from the relapsing fever of Europe, the most striking difference being the shortness of the individual attacks and the small number of spirochaetæ in the blood. The African spirochaetæ, too, seem to be longer than the European form. Chromatin bodies were never seen and there was no evidence of a ciliary layer or of longitudinal splitting. There were frequently noticed, however, spaces or interruptions which gave the impression that the organisms were multiplying by transverse division. By injecting the blood from patients apes could be infected and in them the disease was very severe and often fatal. Cattle, dogs, and other animals were resistant to infection. The disease is carried by the bite of the tick *Ornithodoros moubata*, Murray, which lives in the floors of huts, comes out at night to prey, and hides again in the ground during the day. They are regularly found in the shelters used by caravans, but only in the portion of the ground protected from the rain. Their distribution, however, is a very wide one and they are found in parts far distant from caravan travel. After the tick has drawn blood from the infected person the spirochaetæ disappear in a few days from the stomach, but careful examination shows in a large number of cases that they have become attached to the ovaries, and their number and arrangement indicate

clearly that they have undergone marked increase. After the eggs are laid many of them contain spirochaetae which show evidence of having further increased in number and the ticks developing from these are able to infect monkeys. The ticks examined for spirochaetae showed, as a rule, from 5 to 15 per cent. infected, in some instances the number running to 50 per cent. Of the three Europeans in Koch's caravan, none was taken with relapsing fever because none of them slept in the native huts or shelters. Of five native servants who did sleep in the shelters four were infected. Of the sixty-six carriers, none were infected, although they slept in the huts and shelters, evidently because they had acquired an immunity from previous attacks. Koch thinks there is evidence to show that the disease has always been endemic in East Africa and that the natives, as a rule, acquire complete or partial immunity by an infection in youth. Europeans can guard against the disease by avoiding the native huts or shelters and places where tents have been previously pitched.

Koch makes some interesting observations, suggesting the occurrence of copulation in *Pyroplasma bigeminum* taken from the stomach of ticks. The paragraph is well illustrated.

The parasites of coast fever differ from the well-known pyroplasma of cattle, dogs, and horses in so many respects as to suggest that they are not related to these. They do not show the division in two so characteristic of the pyroplasma, but are regularly divided into four parts, arranged in the form of a cross. Another peculiarity is that the spleen and lymph glands of cattle with coast fever contain a large number of spheroidal bodies (the nature of these bodies is not determined), consisting of bluish protoplasm in which are found many chromatin particles, and these are so constantly present before the organisms appear in the blood as to be of great importance in diagnosis. In their development, however, as seen in the tick's stomach, they resemble so closely the development of *Pyroplasma bigeminum* as to prove their close genetic relationship. It is noteworthy that the development of these parasites has been observed only in the tick *Rhipicephalus australis*, and only in full-grown, fully developed specimens. This would indicate that in coast fever infection is only carried by the young ticks.

Six of the eight varieties of the fly *Glossina* have been found in the German Protectorate. It has been assumed that *Glossina morsitans* is the carrier of tsetse disease, but Koch has shown that it may also be carried by *Glossina pallidipes* and indeed that *Glossina fusca* is principally concerned in its spread. The infectivity of these flies was shown by discovering trypanosomes in great number in the drop of clear fluid which can be expressed from the proboscis by pressure upon the bulb. Infection is not carried by the flies mechanically from one animal to another, but the trypanosomes undergo a development similar to that of the malarial parasite in the mosquito. The train of events Koch describes as follows:

The ingested trypanosomes increase in number in the stomach by longitudinal splitting and also grow in size. After a short time a marked difference is noticeable in these large trypanosomes, some developing a thick plump form, rich in blue-staining plasma and with a large round chromatin body of loose texture; others becoming very thin, with no blue-staining plasma and a long thin compact chromatin body. These forms, Koch thinks, mark sexual differentiation, the large organisms being the females, the slim organisms the males. He is not

prepared to state that copulation occurs or that, as in malaria, microgametes are formed, but there is evidence to indicate that the latter process does occur, as a rule. Further, in the wall of the stomach are found very large trypanosomes with many nuclei, probably representing further development of the impregnated female. It has not been observed, but it is probable that these organisms upon rupture furnish the youngest form of the trypanosome which has been frequently observed in infected flies. These are small spheroidal cells with a single nucleus which show all transition stages to those with nucleus and blepharoplast to which a flagellum is then added. In these young forms the blepharoplast is situated at the head end and only as the organisms advance in age does the blepharoplast pass the nucleus and lie back of it.

In the fluid expressed from the proboscis there are found regularly, besides these young and transition forms, trypanosomes which in size and appearance are identical with those in the blood of animals. It is very probable that infection results from these adult forms. Attempts to inoculate rats with trypanosomes taken from the stomach of a fly were unsuccessful.

Until Koch's work it had not been possible to infect flies by feeding them on animals with trypanosomes in the blood. If they are fed on freshly infected animals with numerous trypanosomes in the blood the organisms entirely disappear from the stomach of the fly as the blood is digested. In a few instances, however, by feeding the flies upon animals that had been infected a long time before and in which trypanosomes appear in the blood only occasionally and in small number, the experiment was successful. This indicates that not all trypanosomes can infect *Glossina*, but only those in some special condition of which we know nothing. This condition seems to be best realized in animals little susceptible to the disease, as buffaloes and antelopes. Both males and females of *Glossina* prey upon animals and can infect by biting others. The females do not lay eggs as other diptera do, but only a single white larva which becomes a pupa in a few days. From ten to twelve days elapse between the laying of larvæ, so that reproduction is very slow. This, Koch thinks, is the weakest point in the chain of trypanosome infections and the point where the attack may yield the best results.

The Experimental Production of Aneurysms.—BERNARD FISCHER (*Deutsch. med. Woch.*, 1905, xxxi., 1713). Since Koester's contention that aneurysms are always due to a circumscribed lesion of the media most of the work upon aneurysms has confirmed his view. A primary tearing of the elastic fibres by high blood pressure has not been satisfactorily established. Experimentally traumatism is never followed by aneurysm formation. Any wound or injury to the arterial wall heals completely and there is not even a local dilatation left to mark its position. Fabris, however, by the use of corrosive substances, has succeeded in producing local necrosis of the vessel wall followed by the formation of true aneurysm, and Josué has produced arteriosclerosis and atheroma without any local insult by repeated intravenous injections of adrenalin. The process in these adrenalin cases, however, is quite different from that in human arteriosclerosis, being due to a primary necrosis of the musculature and elastic lamellæ in the media. Fischer has shown that many poisons are capable of producing this arterio-

necrosis and that it may even arise spontaneously in cachectic rabbits. But the condition is never as general or as well-marked as in animals treated with adrenalin products. These facts demonstrate that a toxic influence upon the musculature plays an important part in the production of arterionecrosis, but that the enormous functional overtaxation upon the arterial system by the high pressure from adrenalin is also of great importance. Of these various toxins, adrenalin was, until recently, the only one which would carry the process far enough to give rise to the formation of genuine aneurysm of the arch. Recently, Fischer has had success using digalen.

The character of the lesion in aneurysm is merely that of further development of the arterionecrosis. The beads which are seen projecting into the lumen of the vessel represent areas of calcified necrosis. These areas are situated chiefly in the centre of the media, seldom reaching quite to the intima, practically never to the adventitia. The middle and inner half of the media are the positions of selection. While the pressure is maintained in the vessel these beads are represented by local dilatations; when the pressure is removed, it depends merely upon the extent of the lesion whether there will be a protrusion or a small aneurysm. If the outer portion of the media is intact the contraction of the muscle fibres and the outer elastic lamellæ cause the protrusion of the calcified media. If the lesion is more extensive and the elastic fibres have undergone degeneration the depression remains even after the pressure is removed. The calcification, Fischer thinks, is a protective feature, believing that the aneurysm would follow more quickly if it were not deposited.

These results which he has obtained upon rabbits cannot be directly referred to man. Similar experiments in dogs gave only negative results. Fischer thinks, however, that they testify to the unequivocal importance of disease of the media in the formation of aneurysms and emphasize, too, the importance of high blood pressure.

While the process in these cases is different from that in genuine arteriosclerosis, Fischer thinks they are opposed in some points to Thoma's views on the formation of arteriosclerosis. As is well known, Thoma insists upon a histomechanical basis, namely, that when the blood flow is slowed there is a connective-tissue overgrowth in the intima. In various grades of dilatation which must have occasioned a masked retardation of the blood flow, Fischer was never able to find evidence of thickening of the intima, even after long standing. Such a thickening he finds only in the presence of inflammatory reaction about the necrosis. He also draws attention to the curious location of the poisonous effects. Only the smooth muscle of the media is attacked, and not even this diffusely, but only in well-circumscribed areas.

The Occurrence of Sudden Death in Families Due to Status Lymphaticus.—ERNST HEDINGER (*Deutsch. Arch. f. klin. Med.*, 1905, lxxxvi., 248) reports the interesting occurrence of sudden death in a child five years old who at the autopsy showed well-marked lesions of status lymphaticus. The patient was the fifth child in a family of nine to die suddenly and under similar conditions. This tendency of the children of certain families to sudden death is referred to as early as 1614 by Felix Plates, who cites the instance of a five months' child dying suddenly in an attack of dyspnoea, two children of the same family having previously succumbed with the same abrupt and unexpected symptoms. Weber

refers to a family in which two nurslings had died suddenly with symptoms of suffocation, and the third child, five months old, dying under the same condition, showed at autopsy marked hypertrophy of the thymus. Barrock records in one of his cases that two children in the same family had been found dead in bed without having shown any previous symptoms of illness.

Friedjung refers to a six months' old child dying from hyperpyrexia during an otherwise inconsiderable febrile disturbance and showing at autopsy marked status lymphaticus. A brother of these children, had died suddenly when a few months old, during convalescence from a slight intestinal catarrh.

Avellis reports two cases of inspiratory stridor in the same family, and Schmidt a family in which four children suffered from the chronic stridor of infancy and three died of it. There were, however, no autopsies to substantiate the view that the attacks were due to an enlarged thymus. Perrin reports a family in which nine out of eleven children died suddenly.

Hedinger's patient was a girl, born December 27, 1893, who developed normally and grew up in apparently perfect health. In March, 1899, the child, while at play, suddenly fell unconscious and became extremely cyanotic. During the attack, which lasted two to three hours, curious high-pitched notes were ejected. After a few days the child had recovered completely. On September 21, 1899, while in the fields harvesting potatoes, she again suddenly fell unconscious and died after a few gasps. At autopsy marked enlargement of the thymus and of all the lymph glands of the body was found, and striking hyperplasia of Peyer's patches and the solitary follicles of the digestive apparatus, marked swelling of the tonsils, enlargement of the spleen, and considerable eccentric hypertrophy of the left ventricle. There was marked hyperæmia of most of the organs, particularly of the abdominal organs. Microscopically, the follicles of the lymph glands and spleen showed a marked enlargement of the germinal centres and in the spleen the veins were crowded with lymphocytes. The medullary portion of the thymus was particularly enlarged and many of the vessels richly filled with lymphocytes. Hedinger believes he has observed in these and other cases of status lymphaticus numerous changes which point to a transition between status lymphaticus, pseudoleukæmia, and leukæmia.

The particularly interesting thing in Hedinger's case is the family history. As has been stated, four children had previously died in the same family with identical symptoms. The first, a boy of five years and three months, always healthy, died in the first attack. The second, a girl in her sixth year, who had always been well except for repeated attacks of tonsillitis, died suddenly while at play. The third, a girl of three years and sixteen days, died similarly. She had previously suffered from frequent but not severe attacks of diarrhœa. The fourth, a boy of five years and four months, died in the fields in his third attack. Four children are alive and well; three were always healthy: eight, nine, and eleven years old respectively. The fourth, a three-year-old child, had at the age of two years a mild attack of cyanosis, from which she recovered and has remained quite well since. The parents were perfectly healthy. They were nearly related, their fathers being brothers. The father of the children was a heavy drinker. No attempt is made to explain this tendency in certain families toward hyperplasia of the lymphatic system.

SURGERY.

UNDER THE CHARGE OF

J. WILLIAM WHITE, M.D.,

JOHN RHEA BARTON PROFESSOR OF SURGERY IN THE UNIVERSITY OF PENNSYLVANIA;
SURGEON TO THE UNIVERSITY HOSPITAL,

AND

T. TURNER THOMAS, M.D.,

ASSISTANT SURGEON TO THE UNIVERSITY AND PHILADELPHIA HOSPITALS, AND ASSISTANT
INSTRUCTOR IN SURGERY IN THE UNIVERSITY OF PENNSYLVANIA.

Transdiaphragmatic Massage of the Heart in a Case of Apparent Death in the Newborn.—VANVERTS (*Annales de la Société Belge de Chirurgie et Journal de Chirurgie*, October, 1905) was called in consultation in a case of difficult labor. The fetal heart sounds were rapid but strong. Version was performed. During the disengagement of the arm the child made an inspiration in utero. When born it was apparently dead. The heart-beat could not be detected, but in the epigastric region there was a continual trembling movement. Artificial respiration, "mouth to mouth," for twenty-five minutes and hot baths were without result. The epigastric tremors continued.

Through an incision along the left costal border two fingers were introduced into the abdominal cavity. When they touched the diaphragm an inspiration occurred. Rhythmical massage of the heart was then carried out by compressing it between the fingers inside and the other hand on the chest outside. No cardiac contraction was felt at any time. From time to time for five minutes an inspiration took place, the interval while not accurately observed being from a half-minute to a minute. At the end of five minutes they disappeared entirely, the epigastric tremors ceasing also.

The writer emphasizes two points in this case: (1) The cardiac massage did not produce a cardiac contraction: the only result was faulty respiration for a short time. (2) The first inspiration, excluding that which occurred in utero, was produced when the fingers touched the diaphragm and before the heart was compressed. The writer thinks that in these conditions, although a cardiac contraction may occur later, it is the touching of the diaphragm and not the cardiac massage which originates the reflex causing the first inspiration. If this is so, then this paper should have been entitled "The Production of Inspiratory Movements by Excitation of the Diaphragm."

The Ventral Decubitus in Surgery.—LAMBOTTE (*Annales de la Société Belge de Chirurgie et Journal de Chirurgie*, October, 1905) believes that the introduction of the ventral decubitus marks an important advance in surgery, and that the operative technique and the indications for many operations will be modified by it. It is applicable to all operations on the posterior surface of the body; as trephining in the occipital region, operations on the back of the neck, shoulders, vertebral column, lungs, posterior surface of the liver, sacrum, pelvic organs, and the posterior surface of the extremities.

The patient is first anesthetized in the dorsal position and then turned absolutely on his face. The arms are permitted to hang from the sides of the table and the extremities to remain in the extended position or to hang from the table according to the necessities of the case. Pads or cushions may be used to elevate this or that part of the body, when desired. Anæsthesia is remarkably easy in this position as compared to the lateral, which Lambotte finds to be a striking advantage in empyema operations. Some cancers of the rectum operated on successfully in this position had been considered inoperable by the old methods. The sacral route offers great advantages for the removal of cancer of the uterus. Two operations were performed for double kidney involvement. One was a double decortication, and the other a double decortication and nephropexy. No change in position is necessary during the whole operation. He reports twenty operations of various kinds done by this method.

Observations on the Removal of the Vermiform Appendix.—KÖLLIKER (*Zentralblatt f. Chirurgie*, October 14, 1905) says that he has made use of an incision, during the past year, which produces a slight wound, and guards against ventral hernia later, as effectually as does the suture of the wound in layers. It is a slightly oblique incision, beginning at McBurney's point and running in the direction of the symphysis pubis for about 8 cm. After the division of the skin and subcutaneous tissues the aponeurosis of the external oblique muscle and the anterior layer of the sheath of the rectus for its outer third or half are divided. The border of the rectus muscle is then separated from its sheath and held aside by a retractor. The tendinous fibres of the internal oblique and transversalis fascia as well as the transversalis are then separated. The incision in the peritoneum is made small, 3 to 4 cm. This incision has the advantage that the peritoneal portion of it lies chiefly under the rectus muscle, and that no muscle has been divided except a few tendinous fibres of the internal oblique and transversalis. In the closing of the wound the peritoneum is sutured separately and the rectus muscle overlies the suture. A second suture seizes all the other layers together.

If after opening the abdomen the visceral relations are distorted and the search for and separation of the appendix gives trouble, the incision can be lengthened at both ends in order to give a better view of the relations. For these cases Kölliker calls attention to two points. The position of the appendix can easily be found if the cæcum is freely exposed and the anterior longitudinal band of the cæcum is followed carefully. The twisted appendix draws the longitudinal band in its direction. If the internal band is convex it speaks for a retrocaecal position of the appendix. If the external longitudinal band is convex then the appendix is situated on the inner side of the cæcum or in the pelvis. Zuckerkandl considers that these varieties are physiological; Kölliker believes that they are due to inflammatory changes.

The Etiology and Treatment of Hernia in Adults.—RUSSELL (*Intercolonial Medical Journal of Australia*, September 20, 1905) says that acquired hernia does not exist in children; that it is invariably dependent upon the presence of a congenital sac, which in the great majority of cases is provided by some portion of the process vaginalis. Only by the complete removal of the sac from the inguinal canal can the

hernia be cured, the so-called curing of the hernia by the use of a truss being a deceptive misnomer.

The writer believes that the direct inguinal, femoral, obturator, and all varieties of hernia other than traumatic are due to the presence of a congenital peritoneal pouch. The best test of this is the fact that the simple removal of the sac cures the hernia in children. The writer has applied the same test in eighty-nine adult herniæ. The canal was not closed by sutures, except in one or two of the earliest cases. The list includes subjects of all ages and herniæ of various duration. Of the eighty-nine cases, twenty-six could not be traced. Of the sixty-three remaining, recurrence took place in three, taking one year's immunity as the standard of success. Russell agrees with Deanesley that recurrence, if it occurs at all, does so in the vast majority of cases within the first six or eight months from the time of operation. In adults, unlike children, because of the length and obliquity of the canal, it is not possible to get at the peritoneum, at or above the internal ring, without slitting up the external oblique. In adults from prolonged stretching and dilatation the canal becomes converted into a large hole in the abdominal wall. Any portion of the peritoneum exposed below the muscular border of the internal oblique and transversalis must be considered a part of the sac and removed. The transversalis fascia should be included in the ligature closing the sac, the inner part of which, especially, is to be drawn up by the ligature. Sutures of the muscles are not necessary, the essential for success being the removal of the sac.

Simplified Operation for Hernia in Children.—HERRING (*Intercolonial Medical Journal of Australia*, September 20, 1905) has devised and practised as a corollary to Mr. Russell's theory (see above) a method of shortening the radical operation for hernia in children. The sac is exposed and opened in the usual way, the contents are reduced into the abdominal cavity, and the incision having been extended to the neck, the sac is turned inside out, exposing the peritoneal surface. The neck of the sac is then divided transversely and the upper cut end closed. The wound is then closed by a subcuticular suture. The sac, having been turned inside out, is left to shrivel up quietly, and an operation ordinarily requiring three-quarters of an hour is reduced to one taking a few minutes.

The Treatment of Racemose Arterial Angioma of the Scalp.—KROGIUS (*Zentralblatt f. Chirurgie*, September 30, 1905) has employed the following treatment, with success, for circoid aneurysm of the scalp. He used two needles, each furnished with a handle, one handle having a slightly curved needle, the other a more marked curve. Both were capable of bending considerably. The needle with the greater curve was passed through the skin to the skull, then along this for a short distance and out through the skin. After being threaded with a strong catgut ligature it is withdrawn, leaving the ligature in position. Through the same point of entrance the second needle is passed and its point made to emerge at the second opening, the track of the needle being just under the skin. The end of the ligature at the second opening is now threaded into the needle and withdrawn through the first. The ligature, which includes in its loop the thickness of the scalp, excluding

the skin, is now tied at the first opening and the ends removed. Other such ligatures are placed, one close to the other, so as to form a chain-like series around the whole tumor, thus shutting off the greater part of its blood supply and causing a shrinkage of it. If the first operation is not a complete success, and more or less of the angioma is left, a second smaller ring of ligatures may be applied around the remaining part of the tumor. The operation may be repeated until the angioma has entirely disappeared.

Four Unusual Cases of Aneurysm.—LOCKE (*Boston Medical and Surgical Journal*, December 14, 1905) says that the first patient was a man, aged thirty-six years, who had syphilis in youth; tuberculosis of both hips for twenty-five years; double inguinal hernia; marked arteriosclerosis; relative mitral insufficiency; tabes dorsalis; chronic interstitial nephritis; deformity of the spine; and aneurysm of the left axillary artery, possibly following trauma, which reached an enormous size and finally ulcerated externally, with death after five days.

The second patient, a colored woman, aged sixty-six years, had arteriosclerosis; aneurysm of the transverse aorta, the first sign of which was hæmatemesis. Nine days later she had a second attack, with death after ten hours, from ulceration and hemorrhage into the œsophagus at the level of the bifurcation of the trachea.

The third patient, a man, aged thirty-six years, had syphilis twelve years ago, and later developed a sacculated aneurysm of the abdominal aorta, with rupture into the retroperitoneal tissue and subsequent erosion of the vertebrae, hydrothorax, atrophy of the left kidney, and arteriosclerosis. An exploratory laparotomy showed a large pulsating tumor occupying the entire upper left quadrant of the abdomen. He was doing well five days later, when he suddenly collapsed with signs of hemorrhage, four months after the onset of the symptoms.

The fourth patient, a male, aged eighty-one years, showed general arteriosclerosis, multiple aneurysm of the abdominal aorta with ulceration into the third portion of the duodenum, and hemorrhage into the stomach and intestines. The symptoms extended over a period of four months. Death occurred four days after rupture.

Contribution to the Surgery of the Prostate Gland.—BARKER (*New York and Philadelphia Medical Journal*, December 16, 1905) thinks that the time when prostatectomy should be done should be settled as definitely as it has been settled for appendicitis. The use of the catheter by the patient should be condemned, because infection invariably follows, and because it encourages the patient to put off the operation until what should be a benign operation becomes a dangerous one. By early operation years of invalidism are avoided. Three essential points in the operation should be aimed at: minimizing the loss of blood, a short operation, and the least possible traumatism. Barker prefers the perineal operation by an inverted U-shaped incision, beginning two-thirds of the distance between the anus and the tuberosity of the ischium, carrying it over the bulb of the urethra and back to a corresponding point on the opposite side of the anus. It affords the maximum of room, enables the operator to see every step of the operation, and avoids the angular flap of the inverted A incision. The various steps of the operation are then described. The sphincter

is divided early in the operation, and later sutured in position again. The membranous urethra is divided on the grooved staff, a special prostatic tractor is introduced into the bladder and its blades opened. By elevating the handle as a lever and using the pubes as a fulcrum the prostate is brought into the operative field and enucleated. To break up the tough bands firmly uniting the gland to the capsule a forceps, with teeth, is used as a tissue crusher. A good-sized drainage tube wrapped with gauze is introduced into each lateral cavity and brought out of each of the two lower corners of the wound. As large a catheter as possible is introduced through the penis into the bladder and retained, for the escape of urine into a urinal and for washing the bladder. The drainage tubes are removed in forty-eight hours. The writer has treated thirty cases in this way, losing one patient who died of senile pneumonia. As for the retention of virility after the operation, so far as he knows, no one has reproduced after this operation.

A Note on Prostatectomy for Hypertrophied Prostate.—LOUMEAU (*Annales des Maladies des Organes Génito-Urinaires*, December 15, 1905) believes that the total transvesical prostatectomy of Freyer offers little opportunity for improvement, judging from his own short experience and the brilliant and abundant results of the promoter of the operation. In four cases, however, in which he diagnosed hypertrophy of the lateral lobes, he failed to enucleate these lobes by the method of Freyer. By cutting through the inferior bladder wall at the summit of each prostatic lobe, with the right index finger through this incision he was able to isolate and extract the lobes. He considers that the transvesical enucleation of a sound and normal prostate is wellnigh impossible. On the contrary, an adenomatous gland, even if very small, can be perfectly enucleated, although this will be much more difficult than in the case of an hypertrophy of large dimensions.

On Some Recent Advances in Urology.—HEITZMANN (*Boston Medical and Surgical Journal*, December 21, 1905) says that the most frequently employed new method of recent years is cryoscopy. This is the determination of the freezing point of blood and urine, which varies according to the number of molecules a solution contains. It is not entirely trustworthy. The methylene blue, phloridzin, electric conductivity, and toxicity tests are not at all reliable. No surgeon should determine upon the removal of one kidney before he has satisfied himself of the functional activity of the other, but no unanimity as to the method to be employed has yet been attained. When the examinations are carefully conducted the microscope is undoubtedly of extreme aid in the diagnosis of many lesions of the genitourinary tract, as the majority, though not all, epithelial cells in the urine are characteristic enough to admit of their location. Not only can nephritis be diagnosed when true tube casts are not present, but also pyelitis, ureteritis, cystitis, prostatitis, and other inflammations, as well as suppurations, ulcerations, and many other conditions. One may judge the constitution of the individual by the character of the pus corpuscle. Microscopic urinalysis of catheterized urines of separate kidneys is much more trustworthy than other methods of determining the functional condition of the kidneys.

A Case of Acute Hemorrhagic Pancreatitis; Operation; Recovery.—JONES (*Liverpool Medico-Chirurgical Journal*, January, 1906) made a diagnosis of some gastric lesion, possibly a perforated gastric ulcer. On opening the abdomen about three pints of free fluid, bright blood mixed with serum, issued from the cavity. The presence of fat necrosis at the entrance of the lesser peritoneal cavity led to an opening through the gastrocolic omentum, which disclosed a discolored cedematous and in places hemorrhagic pancreas. After cleaning out the blood and packing around the pancreas with gauze a longitudinal incision was made in the pancreas. No stone, abscess, or other cause was found. The cavity in the pancreas was packed with gauze, which was brought out of the wound. This was carefully removed in thirty-six hours, being followed by a discharge of clear pancreatic fluid which gave trouble at the upper part of the abdominal wound. Healing was complete, and the patient discharged cured in about ten weeks after the operation.

Cholerrhagia in Hydatid Cysts of the Liver.—TERRIER and DUJARRIER (*Revue de Chirurgie*, January 10, 1906) says that cholerrhagia after the marsupialization of hyatid cysts of the liver is a frequent complication. Two forms should be distinguished: (1) Partial cholerrhagia, much the more frequent, which ceases spontaneously in a variable time, without notable disturbance of the process of healing. (2) Total cholerrhagia, much less frequent without being very rare. It is sometimes accompanied by very grave symptoms and may be fatal. As a rule, it undergoes spontaneous cure, but in some cases it may demand a serious operation to save the patient's life. The writers report three cases of this kind from the literature, which were all that they could find.

That this condition exists before operation is shown by the fact that on opening it the cyst is found to contain bile. It was formerly claimed that bile in a cyst would cure it, and that the bile would kill the parasites. Dévé cites a case in which a cyst ruptured into the biliary passages, and the daughter cysts were engrafted on and continued to live in the biliary ducts. In some cases the cholerrhagia occurs at the time of operation. It occurs much more frequently in the first twenty-four hours, its presence being detected at the first dressing. It is also frequently seen some days or weeks after the operation. In other cases it occurs late when there remains only a fistula, or even after complete cicatrization of the wound. In a case of Kehr's the common bile duct became blocked and the increased pressure in the biliary paths caused the scar to yield with an escape of bile (secondary or consecutive cholerrhagia).

Between the partial and total varieties all grades occur. When total the absence of bile in the feces shows that none is passing into the intestines. In such cases the dressings may be saturated several times a day. The disappearance of the cholerrhagia depends on one of two facts: the closing of the wound in a biliary duct, or the elimination of a biliary obstruction. Suppuration does not appear to play an important part in its causation. When the condition lasts a long time the patient succumbs either to a progressive cachexia or to an intercurrent complication which he cannot withstand. When due to trauma the cause is easily explained, the biliary passages being opened at the time of the

operation, or during the dressing by a forceps, a drain, or a trocar. In the greater number of tardy cholerrhagias, appearing months after operation, at times after the cicatrization of the wound, the cause will be some obstacle in the biliary passages. This may be an obstruction by daughter cysts, a tumor, or inflammation of the common bile duct or ampulla of Vater.

The treatment should be prophylactic and curative. The prophylactic consists in avoiding as far as possible injury to the often denuded, dilated, and friable biliary canals, especially in the removal of the parent membrane of the cyst, and in avoiding unnecessary interference afterward. In the suppurating cysts the membrane is more adherent and requires more care in its removal.

Abscess of the Liver and Precocious Cholerrhagia.—VALENCE (*Revue de Chirurgie*, January 10, 1906) says that precocious cholerrhagia is the escape of bile, pure or mixed with pus, during the twenty-four hours following the incision into an abscess of the liver. It is distinct from primitive and secondary cholerrhagia. The secondary variety occurs when the biliary canals have opened into the pus cavity by the separation of the sloughs, that is, some days after the operation. It ceases when the process of repair is sufficiently advanced. Thrombi of the biliary vessels may also be dislodged by the pressure of the biliary current. Valence believes that with care the drains ought not to produce cholerrhagia, from the hypersecretion of irritation, nor by ulceration into the biliary vessels. Irrigation of the abscess cavity is not responsible for precocious cholerrhagia, since this occurs before the first change in the dressings is made. Of four cases of the precocious variety, collected from the literature, in only one case was curettage done, so that this is not the essential cause.

Bertrand considers that a cholerrhagia is a serious symptom, and is to the biliary vessels what hemorrhage is to the bloodvessels. When excessive it tends to ruin the nutrition. The writer attributes a costal caries in this patient to the dissolving action of the bile which came in contact with it. Catgut sutures will yield to its influence. Fountain advises that the abscess should be opened widely, to permit rapid and complete evacuation, to avoid infection, and to favor prompt cicatrization. This would be the best means of abridging the duration of the biliary flow, and of attenuating its effects. The treatment for hemorrhage under the same circumstances should be carried out (thermocautery, tampon of iodoform gauze, and a gelatin solution of 1 to 10 per cent.). The writer believes that eversion of the edges of the abscess by suturing them to the skin, although adding to the time of the operation, is a good precaution against necrosis from the action of the bile. The skin should be protected from the bile by a smearing of vaselin. Internal treatment must be directed against the failure in nutrition and emaciation.

Two Cases Illustrating Sciatica of Abdominal Origin.—ROSS (*Lancet*, January 13, 1906) reports that in one case the removal of a small, exceedingly tense, central cystic tumor of the left ovary, about the size of a small orange, was followed by a complete disappearance of the symptoms of sciatica. The operation on the second patient resulted in death, but it was evident that a large tumor of the uterine cervix acted mechanically in producing the sciatica.

Some of the Advantages and Fallacies of Urinary Examinations.—SAVIDGE (*Boston Medical and Surgical Journal*, December 21, 1905) says that in almost all patients over forty who put the tension of concentration on their vasomotor system, faint traces of albumin can be found if the urine is examined often enough. This is especially noticeable with those who have overdeveloped venous calibres, whereby the extra capacity of the veins keeps an undue share of the whole volume of the blood in the veins as sewerage blood.

Certain forms of therapeutics can vary the specific gravity of blood; the output of urea can compass the solution of crystals which, like pepper in the eye, must irritate the delicate kidney substance and point to sure future trouble; and in these relaxed venous cases can even remove albumin by enhancing the tonicity of the veins.

Having thus seen the relation between arterial tension by repeated laboratory use; between venous tonicity and albumin; between specific gravity and the appearance and disappearance of haemoglobin; the following conviction has grown: varying these conditions will vary the laboratory findings; and the conditions may exist and be perfectly observable some time before the laboratory will give any finding.

THERAPEUTICS.

UNDER THE CHARGE OF

REYNOLD WEBB WILCOX, M.D., LL.D.,

PROFESSOR OF MEDICINE AND THERAPEUTICS AT THE NEW YORK POST-GRADUATE MEDICAL SCHOOL AND HOSPITAL; VISITING PHYSICIAN TO ST. MARK'S HOSPITAL.

ASSISTED BY

HENRY HUBBARD PELTON, A.M., M.D.,

INSTRUCTOR IN MEDICINE IN THE NEW YORK POST-GRADUATE MEDICAL SCHOOL AND HOSPITAL; CHIEF OF THE MEDICAL CLINIC, PRESBYTERIAN HOSPITAL DISPENSARY, NEW YORK.

Serum Therapy in Scarlet Fever.—W. K. METCHNIKOFF reports upon thirty patients treated by means of serum. In ten Moser's serum was employed and in twenty a serum was used that had been prepared by Professor Sawtschenko, in the laboratory of the University in Kasan, at the children's clinic of which the treatment was carried out. All types of the disease were in the series and there was but one death, recovery without permanent complications occurring in the other instances. In the severe forms injections of six ounces or slightly more were given and were well borne, the pain at the site of injection seldom lasting longer than twenty-four hours. The influence of the treatment upon the course of the disease was most favorable, the temperature became lower, the pulse stronger, and the respiration slower; after from twelve to twenty-four hours the nervous symptoms would become less marked and the throat manifestations ameliorated. The serum, while it did not seem to prevent complications, rendered their course mild and favorable. Albuminuria was noted in four of the patients treated by Moser's serum,

while more of those who received the other serum exhibited nephritis. No glandular suppurations nor complicating otitis occurred. The most constant sequel of the injections was an urticarial or a morbilliform rash which lasted at most but two weeks and was sometimes accompanied by slight rise in temperature. Edema of the face and arm was observed in two instances. Glandular enlargements were rare and evanescent and joint pains were seldom noted. As indications for the repeated use of the serum the author gives continuation of high temperature, small and rapid pulse, and poor general condition.—*Wiener klinisch-therapeutische Wochenschrift*, 1905, Nos. 49 and 50, pp. 1223 and 1233.

Treatment of Leukæmia.—O. F. F. GRUNBAUM states that during the past three years leukaemia has been treated by the *x*-rays, the light being applied to the ends of the long bones and over the spleen. The treatment seems to have been empirical, but since it has been apparently successful in a number of cases, Helber and Linsler have investigated the effect of the *x*-rays upon the blood of healthy animals. They found that the leukocytes in the blood of rats were destroyed by an exposure of five to ten hours. In larger animals the effect was slower. The lymphocytes suffer most while the red cells, blood plaques, and hæmoglobin are insignificantly affected. The usual *x*-ray treatment of leukaemia consists in an exposure of ten to twenty minutes on alternate days; seldom are any unpleasant symptoms caused and the improvement, especially at the beginning, is often striking, the increase in hæmoglobin being rapid and the diminution in the leukocytes most satisfactory. The white cell count, conducted just after exposure, will, at the beginning of treatment, result in an estimate higher than the average throughout the day and in one below the average after treatment has been continued for some time. With the improvement in the blood there is often diminution in the size of the spleen, which is said to be less in chronic than in recent cases. Even those patients in whom the blood becomes practically normal are liable to relapse, and none, so far, has remained well for a sufficiently long time to be considered cured. Dock asserts that no stronger claim can be made for the *x*-rays than for arsenic. The author has observed two patients who failed to improve under the *x*-rays, and who reacted well to arsenic.—*The Practitioner*, 1905, No. 450, p. 767.

Epilepsy and Dechloridation.—CH. MIRALLIE considers that this form of treatment is a great advance in the therapeutics of epilepsy. He concludes a large number of observations with the following *resume*: The diet with diminished chlorides in depriving the nerve cells of sodium chloride renders them more susceptible to excitants and increases their susceptibility to sedatives. In the face of these facts it is necessary to guard all patients undergoing this treatment from exciting influences. This form of diet is an excellent adjuvant to the bromide treatment, since when it is instituted we can, in many cases, obtain results with small doses of bromides equivalent to those obtained with large doses in connection with ordinary diet. Frequently epileptics seem to have a particular appetite for salt; it is principally in such that this type of treatment yields best results. An absolute milk diet is the great aid in accustoming the patients to the regimen from which salt is omitted.—*Gazette médicale de Nantes*, 1905, No. 41, p. 809.

Guaiacol in Renal Tuberculosis.—M. SCHULLER reports two patients whose urine contained tubercle bacilli, and whom he has treated, with excellent results. He gives the drug internally, in doses of 12 to 20 drops, five or six times a day in one-half to one glass of boiled water, and at the same time injects a mixture of guaiacol and iodoform subcutaneously. The internal administration of the drug is continued for a considerable number of months. One of the patients reported was a man with tuberculous orchitis, and the other a child, of three and one-half years, with coxalgia and renal tuberculosis. The guaiacol-iodoform mixture was injected into the hip and at the same time guaiacol was given internally. A year after the beginning of the treatment the hip lesion had cleared up, the patient had gained twenty pounds, and was in excellent health. The urine contained no tubercle bacilli, and the patient was considered cured. After eight years of experience with this form of treatment the author has noted no resulting disturbance of the urinary apparatus.—*La Semaine médicale*, 1905, No. 41, p. 491.

The Diet Lacking in Chlorides in Infantile Nephritis.—G. ARAOZ ALFARO in a paper based upon the results obtained in a number of cases concludes that in children affected with acute nephritis or with acute exacerbations of chronic nephritis the elimination of sodium chloride by the kidneys is more or less disturbed, and if this substance is not excreted by other organs a condition of retention results. The retained salt is prone to cause an interstitial œdema and effusions into the serous cavities. The re-establishment of chloride elimination through the kidneys usually causes a rapid amelioration of the nephritis. The polychloruria indicates the phase of œdema resorption. Since œdema plays a considerable, if not an exclusive, part in the production of the so-called uræmic disturbances it is absolutely essential to withdraw as much as possible of the chlorides which are being introduced into the organism. It is the lack of these substances that explains the classic employment of the milk diet in nephritic conditions. It is, however, easy to arrange a diet which shall contain less salt than milk alone, such as one composed of meat, bread, butter, and vegetables, either associated or not with milk; this is especially indicated when milk is not well borne, and is of great aid in combating the anemia which is so constant in nephritis. Such a mixed diet without salt, but containing a considerable amount of meat, is well tolerated and is extremely active in combating the œdema and uræmia symptoms.—*Annales de la Polyclinique de Paris*, 1905, No. 10, p. 222.

Potassium Iodide in Small Doses in Vasomotor Rhinitis.—C. J. KOENIG reports a case of this affection in a young woman of twenty-one years, which had resisted all forms of treatment. The symptoms were paroxysms of profuse serous discharge, nasal obstruction, frontal headache, conjunctival congestion, etc. He prescribed a 5 per cent. solution of potassium iodide, of which a coffee-spoonful was to be taken in a little milk after the two principal meals. From the beginning of the treatment the crises ceased and cure has been permanent for six months, only occasional snuffling and slight nasal obstruction remaining. As a precaution the author suggests taking the iodide three times a year for a month at a time.—*La Semaine médicale*, 1905, No. 42, p. 500.

The Treatment of Lobar Pneumonia.—LEOPOLD BAYER reports rather remarkable results in ten cases of lobar pneumonia from the following prescription: quinine hydrochloride 2.5 grains, sodium salicylate 5 grains, of which the dose is three or four powders daily. The treatment is harmless, and acts as well in severe cases in old persons as in milder types of the disease. The author has observed improvement in some instances after the administration of the first dose, and considers that this treatment sometimes shortens the disease.—*Therapeutische Monatshefte*, 1905, No. 11, p. 579.

The Treatment of Conjunctival Diphtheria.—G. SOURDILLE concludes a paper upon this subject with the following statements of M. Dugast: The antidiphtheritic serum of Roux injected beneath the conjunctiva of rabbits has no marked local reaction. It does not seem to neutralize the local condition due to the toxin of the infection if the dose is insufficient to immunize the whole body of the animal. Hypodermic injections of antidiphtheritic serum is the only effectual method of treating conjunctival diphtheria. Instillations and subconjunctival injections of antitoxin seem futile. For local treatment irritants should not be employed, either as irrigations or as applications. We should use either sterile water or mild solutions of boric acid, sodium hyposulphite, or potassium permanganate (1 to 3000). Friction, massage, etc., should not be employed to remove the false membrane. In the prevention of corneal complications early injection of antitoxin is most efficacious, and it is necessary carefully to avoid all procedures which may disturb the integrity of the epithelium either chemically or mechanically. If ulceration occurs antitoxin should be administered again and may be repeated daily if necessary. Careful irrigation with mild antiseptics and instillations of 1 to 2000 methylene blue should be given, and after the acuity of the attack collyria of atropine and of pilocarpine may be employed.—*Gazette médicale de Nantes*, 1905, No. 40, p. 781.

Xylol in Smallpox.—M. JOSEPH BELIN has treated variola by the usual means, in addition giving 100 to 120 drops of xylol during the twenty-four hours. For children he prescribes from 15 to 40 drops per day, depending upon the age. The usual mortality of 24 per cent. was reduced by this treatment to 12.5 per cent. Complications were also reduced and the tendency to pitting, as well as the characteristic odor of the disease, were lessened. These results, according to the author, confirm the observations of others and demonstrate the superiority of this form of treatment. M. P. TEOSTIER also testifies to the advantages of the xylol as a deodorant, and states that it tends to arrest or shorten the period of suppuration. He considers this to be the treatment of choice in variola. *Revue française de Médecine et de Chirurgie*, 1905, No. 45, p. 1071.

The X-rays in Leprosy. H. B. WILSON reports the results of the treatment by the x-rays of fourteen patients suffering from leprosy. Of these three have been considered cured, seven improved, and three not improved. The author is inclined to believe that when a local lesion of leprosy is treated with the x-rays the organisms there localized are killed and their bodies are absorbed by the system, producing an immunity against the living organisms. In support of this theory he

cites the following facts: (1) The treatment of one leprous spot causes improvement in other distant lesions. (2) The cure in the distant spots seems to progress with, and to be just as complete as in, the lesion actually treated. (3) The best results seem to be obtained only when the treatment is pushed to the point of destroying or beginning to kill the tissues, which would also probably be to the point of killing the organisms. (4) Subjects in whom there are massive localized deposits improve most rapidly since here we have abundant culture on which to operate and produce immunity. (5) In diffuse general involvement of slight grade or of atrophic character in which there are but a few organisms the author has had but little success. (6) In two patients with advanced leprosy, with a large amount of new leprotic tissue, the improvement was marked and rapid, but was followed by loss of general health and rapid physical decline. The treatment was carried out as follows: The part presenting the greatest amount of leprotic deposit was selected and exposed to the rays ten minutes at a distance of seven to ten inches. The time and distance were varied from time to time, the effect being made to approach as near to burning the skin as possible without actually doing so. The treatment causes a slight tickling sensation; after two or three exposures a blushing of the skin may or may not occur and a sensation of itching is noticed. Burns necessitate the temporary suspension of the treatment.—*Journal of the American Medical Association*, 1906, No. 5, p. 315.

The Roentgen Rays in Glandular Tuberculosis.—J. BERGONIE writes with some enthusiasm concerning the favorable action of the x -rays in glandular tuberculosis. He employs the following method: The tube is placed at a distance of 10 centimetres (about three inches) from the lesion; the exposure is for about five or six minutes, depending upon the condition of the skin; the surrounding tissues are protected by a shield of lead. Treatment is applied every five or eight days, depending upon the cutaneous reaction: properly the skin should first be rose color, then red, and then brown. The rays used are No. 5 or 6, as gauged by the radiochromometer of Benoist, and the treatment lasts from one to three months. Most favorable results have been obtained; the masses of glands diminish in size, the glands become discrete and many disappear, others remaining are of small size but difficult to find and freely movable under the finger. The author suggests the employment of the rays in tuberculous inflammations of the bronchial glands.—*Journal de Médecine de Bordeaux*, 1905, No. 47, p. 825. (Personal experience does not confirm these observations.—R. W. W.)

Lymphatic Leukæmia and Radiotherapy.—M. REXON has followed for several months a patient suffering from lymphatic leukæmia while undergoing x -ray treatment. He has observed that, while there was a noticeable amelioration of the general condition, a considerable diminution in the numbers of lymphocytes, a resolution of the glandular enlargements, and a decrease in the size of the spleen, two factors were present which led him to feel discouraged concerning the ultimate result. There were a diminution of the hæmoglobin and of the red cells and a progressively increasing temperature. While the white cells were diminished from 873,000 to 31,000, the red cells fell from 1,428,000 to 640,000. The temperature for the first three months of treatment

remained between 98.6° and 100.4° F., between 100.4° and 102.2° F. for the next six weeks while the patient seemed to be improving most, and from this time until his death between 102.2° and 104° F. The author considers that the persistence of the febrile movement and the diminution of the red cells after a number of x-ray treatments were more important factors in prognosis than the improvement in the general and local conditions.—*La Semaine médicale*, 1905, No. 46, p. 548.

The Roentgen Rays in Splenic Leukæmia.—ANTON WASSMUTH reports a case of splenic leukæmia which was treated by the x-rays and in which improvement, as evidenced by a diminution of the number of leukocytes in the blood and of the splenic tumor, was noted for a time, but which during the treatment developed pernicious anæmia with typical changes in the red blood cells, hemorrhages, a febrile movement, and nervous symptoms. Death finally took place. The author considers that in the x-rays we have a means of ameliorating the symptoms of leukæmia, but that the treatment does not strike at the root of the disease. The case is also interesting in that it shows that a lymphatic leukæmia may terminate in a pernicious anæmia.—*Wiener klinisch-therapeutische Wochenschrift*, 1905, No. 46, p. 1151. (Evidently more favorable results can be obtained by the Roentgen rays in this form of leukæmia than by any other method hitherto at our disposal, an opinion that has been confirmed by personal observations, as well as by others which have been reported in this country.—R. W. W.)

PEDIATRICS.

UNDER THE CHARGE OF

LOUIS STARR, M.D.,

OF PHILADELPHIA,

AND

THOMPSON S. WESTCOTT, M.D.,

OF PHILADELPHIA.

Venesection in Scarletinoïd Uræmia.—G. SINGER (*Jahrbuch f. Kinderheilkunde*, 1905, Bd. lxii, S. 417) has observed nineteen cases of uræmia in the course of scarlet fever. All were treated by means of venesection; fifteen recovered, four died. In fourteen, nephritis preceded the attack, one had neither albumin nor casts; seven had a diminished amount, four a normal and four an increased amount of urine; twelve had œdema preceding the attack, the other three had no œdema at any time; seven had a slow, tense pulse at the time of the uræmic convulsion, the other eight had a small, frequent pulse, and in them bleeding gave better results than in the others (the only pulse which he considers a contra-indication is the filiform pulse). In nine cases the attack was preceded by an elevation of temperature. In eight of the cases the improvement was immediate, the convulsions disappearing and the consciousness reap-

pearing at once; in two cases improvement was noted in a few hours, consciousness returning twenty-four hours later; in four cases the attacks returned and the venesection had to be repeated (the quantity of blood removed was evidently too small). Of the four patients who died, the causes of death were respectively cardiac weakness, cerebral congestion, and far advanced kidney changes; the last two were admitted in a dying condition. He concludes from his observations that venesection is a rational and beneficial procedure in uremia in the course of scarlatinal nephritis. The operation is simple and without danger. It is chiefly indicated when cerebral irritation governs the picture; in comatose states the operation may do good, but the chances of improvement are smaller. It is indicated in all types of children, strong, weak and anæmic; it is contraindicated in the presence of a filiform pulse. The sooner venesection is performed, the better the patient's chances. The amount removed should be in proportion to the patient's age, and strength and the virulence of the attack. If not successful, venesection may be repeated after twenty-four to thirty-six hours.

Intussusception in Children.—H. HIRSCHSPRUNG (*Mitteilungen aus den Grenzgebieten*, 1905, Bd. xiv. S. 2) reports concerning one hundred and seven cases of intestinal invagination observed in children at one of the Copenhagen hospitals, between 1871 and 1904. There were seventy-seven boys and thirty girls; the youngest was seven weeks old, the three oldest seven years. All of them were in a good state of nutrition, sixty-one being partly or wholly nursed by their mothers. Points of etiological importance were habitual constipation, intestinal catarrh with frequent loose stools, tumors of the intestines, swelling of Peyer's patches, diffuse hemorrhage into the intestines, and intestinal diverticula. In many of the cases a marked tendency to recur was noted. Of the one hundred and seven patients sixty-five (forty-five boys and nineteen girls; 60.75 per cent.) were cured. Of the forty-six boys, twenty-six were less than a year old, the four youngest being only four months old; eight were between one and two years; seven between two and four years; and six between seven and eight years. Of the nineteen girls cured, nine were less than one year old, the youngest being seventy-six days; the oldest were between three and four years. As regards treatment, Hirschsprung refers all cases in which the small intestine is involved to the surgeon; he treats all large intestine invaginations with narcosis, taxis, and enemata. The differential diagnosis is not easily made; eleven patients with unrecognized intussusception of the small intestine died. The prognosis depends much upon the duration of the affection before admission to the hospital; of fifteen children admitted within eleven hours of the onset, ten died, and of forty-one afflicted for more than twenty-four hours, twenty-two died. He closes with the admonition to operate upon all doubtful cases after a short attempt at taxis.

Dentition.—The view that increase in salivary secretion (stimulation of the salivary glands by irritation transmitted from the gums to the tensor tympani) is a sign of approaching dentition is not shared by T. J. ELTERICH (*Pennsylvania Medical Journal*, 1906, ix., p. 378). He considers it more reasonable to assume that the abundant salivary secretion indicates a stage of developmental activity preparing the digestive organs for the aliment to follow, than to regard it as a mani-

festation of a morbid condition of the salivary glands due to dental irritation. Fever, restlessness, and disturbed sleep are often credited to the approaching eruption of a tooth, when more careful examination will show the existence of other conditions sufficiently adequate to produce these symptoms. Many infants cut their teeth without any disturbance of the general health. As a tooth approaching the surface makes the gums almost white and insensitive, he believes the eruption to be absolutely painless and devoid of deleterious symptoms. The thickening of the gum is due to the advancing of the tooth. He considers stomatitis credited to teething due to unclean nipples, bottles, or thumbs. He believes gastrointestinal derangements credited to teething (occurring usually during the weaning period) due to bacterial invasion, improper food, atmospheric changes, etc. Such disturbances should always be treated even though mild. Middle ear inflammations and meningitis have often been observed to follow mild diarrhœas of these types. Otalgia credited to teething is usually due to a pus infection of the middle ear. Bronchitis should always be considered to be due to the child having been exposed to atmospheric changes, and not to nervous irritation reflected from the gums. As the real causes of convulsions are beginning to be known, convulsions attributed to teething are being thinned out. Acute indigestion and rachitis when searched for will probably explain the greater number of the cases. Many causes for cutaneous eruptions besides that of dentition can be found if carefully searched for.

A New Method of Resuscitation in Asphyxia Neonatorum.—After all other methods failed to resuscitate apparently asphyxiated children, W. HIMMELSBACH (*California State Journal of Medicine*, 1906, iv., p. 42) gave newborn children hypodermic injections of strychnine sulphate $\frac{1}{1500}$ grain, and atropine sulphate $\frac{1}{2000}$ grain. After a few minutes in almost all cases he was rewarded with an occasional gasp, and after an hour the children were breathing and crying normally.

Antidiphtheritic Serum in Stomatitis and Vulvovaginitis of Infancy.—After discussing the causation and the treatment of the different varieties of stomatitis, E. GIORELLI and A. BRINDA (*Archives de Médecine des Enfants*, 1905, viii., p. 724) report having treated twenty-five patients so afflicted with injections of antidiphtheritic serum and invariably with good results. They were led to employ it first in the case of a four-year-old boy in whom the process continued spreading along the right cheek, gum, and right side of the tongue in spite of the usual applications; the process had existed for ten days. After six injections of 500 units each the patient was on the road to recovery. Many of the patients recovered after one injection of 1000 units; in none were more than 5000 units necessary. Many of the children were studied bacteriologically; in most of them only streptococci and the pneumobacillus of Friedländer were found; in a few a bacillus resembling the Löffler organism. They pursued the same line of treatment in nine cases of ulcerating vulvovaginitis in infants, using from one to five injections in each case. In three of them gonococci were discovered; in the other six bacteriological studies could not be made, but the authors are satisfied that they were not of gonococcal origin. In all nine rapid recovery followed the use of the serum.

OBSTETRICS.

UNDER THE CHARGE OF

EDWARD P. DAVIS, A.M., M.D.,

PROFESSOR OF OBSTETRICS IN THE JEFFERSON MEDICAL COLLEGE, PHILADELPHIA, ETC.

Hæmatology of Pregnancy and the Puerperal Period.—GIVEN (*Journal of Obstetrics of the British Empire*, April, 1906) contributes a paper upon this subject, giving results of the study of the blood in twelve consecutive cases during pregnancy and the puerperal period. The examinations were made about noon each day to avoid the influence of digestion. The first examination in each case was made before labor and further examinations were made twenty-four hours later, after delivery. The red cells were few in number at the end of pregnancy and a further slight diminution occurred immediately after labor; then the number was increased to normal. The leukocytes were increased before labor, being 10,500; within twenty-four hours after labor they rose to between 15,000 and 16,000, and then gradually dropped to 7250 on the twelfth day.

Given concludes from these observations that in the last months of pregnancy there is a slight leukocytosis; probably commencing during labor, there is observed a sudden and well-marked leukocytosis immediately after labor; this is a polymorphonuclear increase and rapidly falls to normal. This change is equally common in primiparæ and multiparæ, and occurs alike at full term or premature labor. When the child dies before labor commences and when there is deficient excretion the change is but slight. It is not influenced by chloroform and other drugs.

There is a well-marked increase in lymphocytes commencing a few days after delivery and being very marked during the second and third weeks. This seems to be connected with involution of the uterus. The more marked this change is the better the patient is doing and the more rapid is her return to health.

Chronic Inversion of the Uterus of Puerperal Origin.—MCLAIN (*Journal of Obstetrics of the British Empire*, April, 1906) reports a case of a multipara who at labor had retained placenta and considerable traction on the cord; this was finally followed by the delivery of the placenta and membranes; hemorrhage persisted and its cause was unrecognized. On examination the uterus was inverted, the mucous membrane soft, and considerable hemorrhage occurred upon slight manipulation. Under deep anæsthesia a volsellum forceps was fixed anteriorly and posteriorly in the middle line at the junction of the cervix and vagina. Pressure applied against these points caused the contraction ring to become evident; four forceps were then applied, when with pressure by the thumbs over the fundus the uterus was gradually replaced. Iodine was applied thoroughly to the cavity, sterile gauze was firmly packed, and a silkworm-gut suture was applied at each angle of the widely opened cervix. The patient made a good recovery.

A Simple Device for Extraction of the Child in Breech Presentation.—WIENSKOWITZ (*Zentralblatt f. Gynäkologie*, 1906, No. 13) has used for some time a strong, red rubber band about two and one-half feet long and one-half inch in width. This can be disinfected by boiling; it is introduced without difficulty, passed over the thighs of the child, and traction made at intervals with the hand. No injury was done to the child by this method and the results were exceedingly satisfactory.

Pregnancy Complicated by Gangrene of the Vulva.—GOTÉ (*Zentralblatt f. Gynäkologie*, 1906, No. 18) reports the case of a patient, aged eighteen years, a multipara, who while lifting a heavy basket bruised the external genitals. Three days afterward swelling occurred with pain on motion, and on examination, redness, swelling, and infiltration were found. This went on to necrosis, and it was necessary to open certain areas with the electrocautery. The patient made a tedious recovery from the gangrenous condition in forty-three days. She was found to be about five weeks pregnant.

GYNECOLOGY.

UNDER THE CHARGE OF

HENRY C. COE, M.D.,
OF NEW YORK.

Relaxation of the Uterus during Curettement.—VAN TUSSENBROCK (*Zentralblatt f. Gynäkologie*, No. 2, 1906) discusses this question at length, aiming at the conclusion that the atony of the uterine muscle sometimes observed during curettement is not due to narcosis, but to direct irritation by the curette. That this atony is of a reflex character is shown by the fact that it is often local, being confined to the cornua or to the anterior wall. Whether this reflex action is of central or peripheral origin is not yet certain.

The writer agrees with other observers that the introduction of laminaria tents may favor uterine relaxation, which is increased by the subsequent curetting.

Observations in Menstruation.—SHAEFFER (*Zentralblatt f. Gynäkologie*, No. 2, 1906) bases his deductions on 10,500 cases. The average age at which menstruation began was 15.7 years, being a little later in the case of girls living in cities. In 85 per cent. menstruation began between the years of thirteen and eighteen.

As regards the menopause the writer states that the great difficulty in collecting prime statistics is due to the frequency of pathological conditions. The average age in 903 cases was 47.26 years, the earliest age being twenty-eight and the latest fifty-seven years.

It was found that in women who menstruate early the menopause is established about one year later than the average.

Metastases in Carcinoma of the Ovary.—In a discussion on this subject before the Dresden Gynecological Society (*Zentralblatt f. Gynäkologie*, No. 2, 1906) WEINDLER denied that metastases occurred in the stomach. Schmarl affirmed that he had found secondary cancer of the ovaries in connection with primary disease of the stomach, breast, lungs, and even the mouth and œsophagus, although no clinical symptoms referable to the pelvis might be present.

Von Holst cited a case in which cancer of the ovary developed a year after supravaginal amputation for uterine fibroid, with secondary deposits in the abdominal viscera. Although there was no evidence of malignant disease at the time of the operation it must have been present.

Early Operation in Appendicitis.—KROGINS (*Deutsche Zeitschrift f. Chirurgie*, Band lxxviii., Heft 4 to 6) understands by this operative intervention during the first thirty-six hours. He urges its importance in view of the lower mortality in seven cases, recognizing two types—the perforation characterized by sudden onset and severe pain, and the gangrenous, in which the initial symptoms are not so severe as in the former, but become rapidly worse. The indications for prompt intervention are general muscular rigidity of the abdominal wall, diffuse tenderness on pressure, severe pain, rapid and soft pulse, repeated chills, vomiting, and constipation.

Chorioepithelioma.—LISSAUER (*Zeitschrift f. Krebsforschung*, Band iii., Heft 2) reports a case in which he performed an autopsy upon a patient dying from cancerous disease of the pulmonary artery two years after extirpating the uterus. No other foci were found in the body. That the thrombus had developed slowly was proved by the presence of marked hypertrophy of the right ventricle. The chorion epithelium had evidently developed within the lumen of the vessel and had not extended from without inward.

Globus Hystericus.—BUCH (*St. Petersburger med. Wochenschrift*, Band xxii., No. 4) differs from the other writers who regard globus as a sensation of cramps in the œsophagus, regarding it as purely a sensory phenomenon and not a true œsophagismus of sympathetic origin. Excitation of the lumbar sympathetic plexus is conveyed upward from one set of ganglia to the next above until the sensory centres are involved. The sensation is one of pressure, and when it reaches the throat gives the impression of a foreign body.

The writer denies that the globus is pathognomonic of hysteria, believing that it is merely a symptom of general hyperalgesia of the sympathetic nerves, which may be present in other conditions. He noted only one case of hysteria among twenty in which the globus was present, most of the patients being chlorotic females, who all recovered under the administration of iron or arsenic.

Appendicitis Accompanying Disease of the Adnexa.—ROSE (*Zentralblatt f. Gynäkologie*, No. 4, 1906) found the appendix diseased in thirteen out of 199 cases in which he operated for diseased adnexa. In every instance the appendicular disease was secondary. The writer has never seen a case in which inflammation extended from the appendix to the pelvic organs.

The diagnosis is difficult. In eight cases it was made from the presence of tenderness over McBurney's point. In these an incision was made along the border of the right rectus.

The writer recommends that abdominal section should be preferred to vaginal section whenever an appendicular complication is suspected and that the adherent appendix should always be removed, not simply freed.

Intestinal Autointoxication after Laparotomy.—KELLER (*Zentralblatt f. Gynäkologie*, No. 4, 1906) reports two cases in which fever, rapid pulse, and tympanites developed after operation, with obstinate constipation and indican reaction in the urine. The patients finally became comatose. Only on the fifth day did he succeed in moving the bowels by purgatives and enemata, the stools being foul-smelling. Irregular diarrhoea followed, the symptoms gradually subsided, and the patients subsequently convalesced normally.

The writer advises giving nourishment by the mouth as soon as possible after operation, the avoidance of opium, and early evacuation of the bowels.

Results of Ovariectomy.—FRITSCH (*Zentralblatt f. Gynäkologie*, No. 4, 1906) reports 989 ovariectomies performed in the course of twenty-two years, with a mortality of 7.1 per cent. Only 2.3 per cent. were due to sepsis. In forty-eight out of seventy deaths the tumors were malignant.

The writer calls attention to the great improvement in statistics since Hegar, in 1874, affirmed that the only indication for the removal of a tumor was the symptoms to which it gave rise.

Tuberculous Ovarian Cysts.—In the *Lyon Médical*, February 26, 1906, are reported two cases of ovarian cystoma in which the lining membrane was studded with miliary nodules in one instance and with cheesy masses in the other. No other tuberculous foci were discoverable. Sixteen similar cases have been reported, some of which were doubtful.

In order to establish the authenticity of a case it must be shown, that the cyst is ovarian, that the disease has not extended from a tuberculous salpingitis, and that undoubted tubercles are present. Either the interior or exterior of the cyst may be affected. The disease is in most instances secondary to tuberculous salpingitis or peritonitis, being conveyed by the lymphatics.

OPHTHALMOLOGY.

 UNDER THE CHARGE OF

 EDWARD JACKSON A.M., M.D.,
 OF DENVER, COLORADO,

AND

 T. B. SCHNEIDEMAN, A.M., M.D.,
 PROFESSOR OF DISEASES OF THE EYE IN THE PHILADELPHIA POLYCLINIC.

A Case of Permanent Extensive Changes of Both Maculæ from the Direct Rays of the Sun.—ZURN (*Græfe's Archiv f. Ophthalm.*, lx., 3) reports the case of a weak-minded boy who had looked for some time, on a morning near the end of May, directly at the sun; the next day the lad noticed that his sight was not so good. Examination December 1st: R. vision equalled fingers at 3 metres; L., fingers at 3.5 metres. Jaeger at 22 cm. eccentric fixation, periphery of the field normal, small absolute scotoma nearly central. The ophthalmoscope showed in both eyes in the region of the maculæ oval patches (about one disk diameter vertical by one and one-half horizontal) moderately pigmented and bordered by interrupted strongly pigmented margins. Brilliant stipplings and small yellowish spots could be seen scattered among the patches. The visual acuity finally increased to about double that noted above with no change in the fundus.

Rheumatism of the Ocular Muscles.—PICHLER (*Wien. klin. Wochen.*, No. 14, 1905) observed among one hundred and sixty patients with acute rheumatism of the joints four cases of rheumatism of the ocular muscles. There was no formation of nodules, there was uniformly slight swelling, the redness was diffuse not sharply defined, and separated from the cornea by a broad pale zone. The tendons were sensitive to pressure.

Is the Sclera of Myopic Eyeballs Deficient in Elastic Fibres?—ELSCHNIG (*Wien. klin. Rundschau*, No. 29, 1905) finds that Lange's hypothesis that myopia depends upon congenital deficiency of elastic fibres in the sclera is unfounded. His own researches showed that as regards the scleral elastic fibres the myopic eyeballs are exactly like the emmetropic; the sclera of the former presents a decidedly greater degree of thinning in the region of the staphyloma than would simply correspond to a sclera of normal thickness which had undergone thinning in consequence of the stretching and lengthening of the optic axis, and this is the only characteristic of the sclera of a myopic eyeball.

The Sole Prophylaxis against School Myopia.—GRUNNERT (*Ophthalm. Society of Heidelberg*, reviewed in the *Archiv. d'Ophthalm.*, Nov. 1905) denies the existence of congenital predisposition to myopia. The best preventive consists in diminishing reading and writing in the primary classes. Exercises in reading and writing should not begin until the

child is eight years old. These statements were contradicted by others present, upon the ground of too rigid formulation. Siegrist insisted upon the role played by astigmatism and opacities of the cornea in the etiology of myopia. Astigmatism being congenital does constitute a congenital predisposition to myopia.

Lange's assertion that congenital predisposition to myopia is due to a relative deficiency of elastic fibres in the sclera is denied by other observers.

III Effects of Adrenalin.—BOUCHART (*Revue d'Ophtal.*, May, 1905) has noted the following phenomena after a tenotomy done under a mixture of adrenalin and cocaine: Persistent mydriasis, exudate into the iris localized in the crypt zone with loss of pigment and atrophy, loss of transparency of the cornea with bullae. The reporter believes that the conditions noted were caused by the adrenalin, for the reason that they greatly resemble the effects of the drug produced experimentally, that the lesions disappeared under remedies causing hyperemia and myotics, and that the phenomena were most marked in the region nearest the field of operation.

DISEASES OF THE LARYNX AND CONTIGUOUS STRUCTURES.

UNDER THE CHARGE OF
J. SOLIS-COHEN, M.D.,
OF PHILADELPHIA.

Roentgen Rays in the Diagnosis of Disease of the Frontal Sinus.—DR. GOLDMANN, of Freiberg, gave a demonstration of the utilization of the Roentgen rays in the region of the frontal sinus (*Elfte Versammlung Sddeutscher Laryngologen*, 1904). The patient lies down with the forehead upon the photographic plate. The exposure varies from one and one-half to two minutes, according to the thickness of the skull and the age of the patient. The frontal sinuses are thoroughly revealed in their frontal aspect. In addition to the frontal, temporal, and orbital bulgings the frontal cells lying under the frontal process of the upper jaw can be recognized, likewise the region of the nasal lacrymal duct, and in favorable cases the maxillary sinuses also.

Successful Tracheotomy and Laryngofissure in a Case of Fibroma of the Larynx and Trachea.—DR. E. VON NAVRATIL reported to the Hungarian Society of Medicine of Buda-Pesth (*Revue hebdomadaire de Laryngologie, d'Otologie et de Rhinologie*, November 11, 1905) a case of fibroma of the larynx and trachea in a man forty-five years of age, who arrived at the hospital in such a suffocating condition that tracheotomy had to be performed immediately. Laryngoscopic examination revealed the larynx entirely filled with a large pale-red tumor. Attempts at endolaryngeal removal were difficult and unsatisfactory, though several pieces were removed. Subsequently, the larynx was opened in the median

line and revealed the presence of two growths, one the size of a walnut, the other smaller. They were cut off at their base close to the intact vocal bands and thyroarytenoid ligaments. Cartilage and skin were both closed with suture. Cicatrization took place by first intention, respiration was promptly re-established, and the voice soon became clear. Histological examination showed it to be soft fibroma.

Disintegration of a Peanut in the Bronchus.—PROFESSOR THOMAS A. CLAYTOR, of Washington, D. C., reports (*Journal of the American Medical Association*, November 11, 1905) a case of foreign body in a bronchus which seems to indicate the spontaneous disintegration of a peanut incarcerated in the right primitive bronchus.

Hemorrhage of the Vocal Band.—A. J. BRADY, of Sydney Hospital, N. S. W. (*Journal of Laryngology, Rhinology and Otology*, November, 1905), reports a case of sudden voicelessness in a professional singer while singing, which was found to be due to a rupture of a small blood-vessel in the submucosa gland, and was attributed to singing music above the normal register.

Foreign Body Removed from the Right Bronchus.—DR. CHAS. A. ELSBERG, of New York, reports (*The Laryngoscope*, December, 1905) the removal from the right bronchus, under bronchoscopy, through a tracheal incision, of a pin one and a half inches in length from a child four years of age. A very ingenious procedure was employed to bend the pin upon itself so that it could be grasped at the bend and be thus readily extracted.

Temporary Injury to Voice during Operation upon the Thyroid Gland.—At a meeting of the California Academy of Medicine, January 20, 1906 (*Journal of the American Medical Association*, March 17, 1906), DR. W. I. TERRY, in a report of nine successful operations upon the thyroid gland under local anesthesia, mentioned one patient whose voice suddenly became squeaky while the inferior thyroid artery was being tied, when it needed only readjustment of the ligature to free the nerve, which was not itself seen.

Laryngeal Tuberculosis.—An unusual case of laryngeal tuberculosis is reported by DR. OTTO J. STEIN, of Chicago (*The Laryngoscope*, November, 1905). A rugged clothing merchant, fifty years of age, was suddenly seized with acute pain in the right abdomen. A month later the abdomen was opened and a portion of diseased omentum removed. The surgeon considered this omentum tuberculous. Soon afterward hoarseness supervened and in a short time the larynx presented serious ulceration in both vocal bands with other tuberculous manifestations in other portions of the structure. No tubercle bacilli could be found in the secretions, in the expectoration, nor in the debris removed by curetting. Four years ensued before any inflammation of the lungs could be detected, and four months later the patient succumbed. At the autopsy there was no evidence of recurrence in the omentum. The first two or three feet of the small intestine showed several areas of tuberculous infiltration, but without any breaking down of the tissue; the remaining portions of the alimentary canal seeming normal. Both

lungs were peppered throughout with miliary infiltration. There were no abscess cavities nor cicatrices to be found, and only a few calcareous spots. The larynx was very much involved, almost every part having participated in the tuberculous process.

Syphilis of the Upper Air Passages.—In a lecture on "Some Unusual Manifestations of Syphilis in the Upper Air Passages," delivered at the London Polyclinic by SIR FELIX SEMON (*British Medical Journal*, January 13, 1906), the subject was illustrated by the report of four cases. In the first one, a precocious tertiary syphilis of the throat and tongue of malignant type, after failure with the approved methods of the day a cure was effected with Zittmann's decoctions. (The compiler can confirm the value of this old-fashioned and almost neglected treatment in analogous instances.) The other cases reported were respectively: one of tertiary syphilis of the larynx and trachea followed by isolated tertiary syphilis of the rhinopharyngeal cavity; early fibroid infiltration of the pharynx and larynx in a case of obstinate recurring secondary syphilis; and tertiary syphilis of the larynx manifested particularly by periodic inflammation with the production of ephemeral papillomatous excrescences.

Roentgen Ray Illumination in Diseases of Accessory Sinuses.—MOSHER (*The Laryngoscope*, February, 1906) contributes a valuable paper upon the use of the x -rays in sinus diseases, with illustrations from radiograms of a number of patients and detailed interpretations thereof. These reproductions are far more distinct than could possibly be procured from any similar plates which the compiler has yet seen.

The Point of Origin of Mucous Polyps in the Posterior Nares.—KILLIAN (*Annales des Maladies de l'Oreille, du Larynx, du Nez et du Pharynx*, Mai, 1906) maintains as a result of his clinical experience and histological investigations that the unilateral and solitary mucous polyp of the posterior nares has its origin in the mucous membrane of the maxillary sinus.

Fatal Pyemia following the Removal of the Posterior End of the Left Inferior Turbinate. STEIN (*The Laryngoscope*, January, 1906) reports a case of acute bilateral middle ear suppuration following the removal of the posterior end of the left inferior turbinate in a woman, forty-one years of age, and resulting fatally.

Osseous Occlusion of the Nasal Passages.—BOTHEY (*Annales des Maladies de l'Oreille, du Larynx, du Nez et du Pharynx*, April, 1906) reports a case of complete congenital osseous occlusion of the entire right nasal fossa. A similar imperfect, but almost complete, atresia existed upon the left side. The patient was a female, aged nineteen years, a subject of hereditary syphilis with hyperostoses of various bones of the face and of both tibiae. Entire relief to the nasal respiration was produced by tunnelling the passage through the bone, principally with gouge and mallet. Seven weeks thereafter the patient was well, both nasal fossa being thoroughly permeable.

DERMATOLOGY.

UNDER THE CHARGE OF

LOUIS A. DUHRING, M.D.,

PROFESSOR OF DERMATOLOGY IN THE UNIVERSITY OF PENNSYLVANIA,

AND

MILTON B. HARTZELL, M.D.

INSTRUCTOR IN DERMATOLOGY IN THE UNIVERSITY OF PENNSYLVANIA.

A Case of Systematic Blastomycosis, with Blastomycetes in the Sputum.—EISENDRATH and ORMSBY (*Journal of the American Medical Association*, Oct. 7, 1905) report a new case of systemic blastomycosis. The patient was a Polish laborer, aged thirty-three years, who began to be ill in February, 1904, with a feeling of discomfort in the right side of the chest. Four months later the first cutaneous lesion appeared and was shortly followed by others. Upon his admission to the hospital in February, 1905, he was much emaciated, very weak, and had some elevation of temperature. At this time, variously sized lesions were present on the legs, forearm and face. Pus removed from an unruptured abscess on the left forearm and inoculated upon various media produced pure cultures of blastomycetes. This pus was also examined for tubercle bacilli, with negative results, and injections of tuberculin likewise gave negative results. Although the patient denied having any considerable cough or expectoration, considerable blood-stained, mucopurulent sputum was collected on one occasion in which numerous blastomycetes were found. The apex and upper lobe of the right lung were dull posteriorly and there was practical absence of lung expansion. Under large doses of potassium iodide internally, with radiotherapy and antiseptic dressings locally, improvement occurred, and the patient left the hospital greatly improved. When seen a few weeks later, however, he was found to have relapsed. Guinea-pigs inoculated with pus, sputum, and granulation tissue from an abscess wall produced local, but no general infection.

Black Penis due to Antipyrin.—H. MALHERBE (*Jour. des Mal. Cut. et Syph.*, July, 1904, p. 499) described the case of a man, aged thirty years, accustomed to taking antipyrin for migraine, who after one dose of about 22 grains observed the penis turning black. Aside from the color of the skin the penis was normal. Similar cases have been seen by Fournier, who recorded three cases in 1899. Considerable tonic treatment is usually required for its disappearance. In nature the condition may be compared with the persistent erythematopigmented diseases described by Brocq.

Lupus Erythematosus is not Tuberculous.—O. KREN (*Archiv. f. Derm.*, vol. lxxv. p. 303) arrives at this conclusion: In a patient who at death showed atypical lupus erythematosus, the autopsy gave no proof of tuberculosis of any organ. The theory of the cutaneous disease being the result of toxins of tuberculosis is not borne out by the observations that have been collected.

Origin of Pigment.—EHRMANN, so favorably known for his work on the pigment of the human body, concludes (*Brit. Journ. of Derm.*, October, 1905, p. 385): (1) That melanin is intracellular, and in the situations where it is present occurs in the deeper layers of epidermal cells and in certain mesoblastic cells known as melanoblasts; (2) that melanoblasts are specialized connective-tissue cells, which are round, spindle-shaped, or branching, and are peculiar not only in containing melanin granules, but also in having larger nuclei, which stain more faintly than those of ordinary connective-tissue cells; (3) that melanoblasts occur in the upper layers of the corium, are specially noticeable around the bloodvessels, and are also present as peculiar branching structures in the interepithelial lymphatic spaces of the deeper portion of the epidermis; (4) that melanin is a derivative of blood-pigment, the material from which it is formed getting out of the bloodvessels, into the perivascular tissue-spaces, where it is taken up by the melanoblasts and transformed into melanin; and (5) that the epidermal cells do not elaborate melanin, but absorb it from the melanoblasts in the interepithelial lymphatics.

Diseases of the Skin in Kidney Diseases.—A. JORDAN (*Monatsh. f. pract. Derm.*, vol. xxxix, p. 637) has observed two cases of pruritus and of generalized furunculosis, two cases of eczema, and one of gangrene in subjects who presented a larger or smaller percentage of albumin in the urine; but neither these observations nor other rare cases published are sufficient to warrant the creation of a special group of albuminic dermatoses. It, nevertheless, must be admitted without question that there exist some diseases of the skin which have a direct connection with the renal function, and to these Thiebierge in particular, directed special attention in 1885.

Mercury in Syphilis.—OTTO LERCH (*American Medicine*, November 4, 1905) explains why mercury is more effective when given by inunction than other methods. By inunction it is absorbed by the lymphatics and comes in direct and immediate contact with the virus. Enlarged glands will yield to inunction after resisting every other treatment. Lesions of the bloodvessels, viscera, bones, and the nervous system follow the lymphadenitis. Enlarged glands are found early in the disease and they may be palpated when every other symptom has disappeared. They contain the virus, and a late secondary infection may be explained as originating from them when the resisting power of the organism is lowered. Deep-seated glands cannot be inspected, and it is, therefore, impossible to say when a patient is cured. Antiluetic treatment should be tried in tabes and paresis, as it is often impossible to make a positive diagnosis. A certain analogy between syphilis and tuberculosis has led him to give inunctions of iodoform in tuberculosis, and with good results.

PATHOLOGY AND BACTERIOLOGY.

UNDER THE CHARGE OF

WARFIELD T. LONGCOPE, M.D.,

DIRECTOR OF THE AYER CLINICAL LABORATORY, PENNSYLVANIA HOSPITAL.

ASSISTED BY

G. CANBY ROBINSON, M.D.

RESIDENT PATHOLOGIST, PENNSYLVANIA HOSPITAL, PHILADELPHIA.

The Influenza Bacillus and its Role as a Cause of Disease.—JOCHMANN (*Deut. Arch. f. klin. Med.*, 1905, Bd. lxxxiv. p. 470) presents his views, which are based on much personal investigation, upon the role that the influenza bacillus plays in the production of disease.

In working with the organism he finds that, in spite of statements to the contrary, hæmoglobin is always necessary in culture media for its growth. He confirms the work of others in regard to the growth of the organism in symbiosis with the staphylococcus, gonococcus, and xerosis bacillus, and finds that the presence of the pneumococcus and streptococcus also favor the growth of the bacillus.

The author investigated the blood of all his cases in which the sputum showed the organism, but was never able to obtain influenza bacilli from this source, and he considers the invasion of the blood by the influenza bacillus very rare in spite of the numerous positive findings of Jehle and others, whom he believes were dealing with agonal or post-mortem infections.

A thorough study of the occurrence of the organism in the diseases of childhood, as measles, diphtheria, scarlet fever, and whooping-cough, was made. He frequently found the organism in the first three diseases present as a saprophyte, and without having any apparent influence on the course of the disease, and its presence is not sufficient evidence to consider the original disease complicated by influenza. All of these diseases, however, showed not infrequently catarrhal bronchitis and lobular pneumonia, from which the organism could be obtained in great numbers. Jochmann considers that these complications are due to the influenza bacillus.

In whooping-cough a bacillus, morphologically and culturally identical with Pfeiffer's bacillus, was so constantly found in the sputum, that the author considers it proved as the cause of whooping-cough, as much as it is proved to be the cause of influenza.

The presence of the organism has been shown in tuberculous and bronchiectatic cavities of the lungs, where it may exist without influencing the course of the pre-existing disease, although in pandemics the influenza bacillus may give rise to a terminal infection in tuberculosis.

The author is opposed to recognizing chronic influenza upon bacteriological findings alone.

Jochmann's recent experience with endemic influenza has shown him that the bacillus is present in certain cases only in small numbers or seems to be absent, while other pathogenic organisms may be pre-

sent in large numbers. This has led him to hold, that, although the bacillus of Pfeiffer is the cause of epidemic influenza, other organisms, especially the pneumococcus, streptococcus, and perhaps the micrococcus catarrhalis, must be considered accountable for endemic cases when a symptom-complex similar to the epidemic form is seen. He suggests that grippé be the name given to the cases caused by these other organisms, and influenza be reserved for the symptom-complex together with the isolation of the influenza bacillus in large numbers.

He considers bacteriological findings alone insufficient evidence upon which to make the diagnosis of influenza.

Hamartoma (Tumor-like Malformations) of Kidney and Liver.—At the suggestion of Albrecht, GENEWEIN (*Zeit. f. Heilk.*, 1905, Bd. xxvi. p. 430) has studied the small, circumscribed fibrous nodules found so often in the medulla of the kidney, and frequently in the liver, to determine their exact relationship to true tumors. He finds on microscopic examination that the nodules from the kidney, so well circumscribed microscopically, have ill-defined borders, and that their margins run imperceptibly into normal kidney substance. They are formed of regularly arranged connective-tissue fibres, continuous with the connective tissue of the surrounding structures, and contain normal or almost normal kidney tubules, which are probably the descending loops of Henle. These nodules are distinctly different from tumors as defined by Borst and others, in that they are composed of elements differing in no respect from the normal structure of the organs in which they are found, and show no new-formation of their elements. The only difference from the surrounding medulla seems to be in the increase of the connective tissue about and between the tubules. The author believes that they are tumor-like malformations of fetal origin, and suggests for them the name of "hamartoma fibrocantabulare." Analogous structures were found in the liver. Here the connective tissue was pierced by bile canaliculi. The type of structure and mode of origin were considered to be the same as for the nodules in the kidney.

A Specific Serum for Trypanosoma Brucei and its Action upon Trypanosoma Gambiense.—KLEINE and MOLLERS (*Zeit. f. Hygiene und Infekt.*, 1906, Band lii. p. 229) inoculated asses with the serum of rats inoculated with *Trypanosoma brucei*. It was impossible to use the blood of rats, for this produced grave constitutional disturbances in the asses owing to the resulting hemolysis. By centrifugalizing the defibrinated blood of the rats a clear serum could be obtained containing enormous numbers of trypanosomes. 30 c.c. of serum was given at a dose and four doses were given at fourteen-day intervals. After the second dose the serum of the ass showed protective substance against trypanosoma infection in mice, which the normal serum did not contain; 0.5 c.c. of serum protected mice and prevented the appearance of trypanosomes in the blood against doses of 0.2 c.c. of trypanosoma laden blood injected intraperitoneally, while control mice died in five to six days. The serum had no curative properties, though it delayed the death of the animals. Much the same results were obtained if guinea-pigs instead of mice were used. Against infections by *Trypanosoma gambiense* there was no specific action, though repeated doses of the *T. brucei* serum retarded definitely the appearance and devel-

opment of *T. gambiense* in the blood of infected mice. The asses that furnished this serum did not develop an active immunity, but, on the other hand, emaciated and died. Microscopic examination of the blood failed to show trypanosomes, but if large quantities of serum (20 c.c.) were injected into dogs, the dogs developed trypanosomiasis, from which they died. The authors believe that in the ass the trypanosomes acquire an immunity against the serum.

Working with brilliant green, Wendelstadt and Fellner (*ibid.*, p. 263) have discovered that this substance has much the same effect upon the trypanosomes in infected animals as was shown to exist for trypanoth by Shiga and Ehrlich. Injections of brilliant green in rats and apes whose blood is swarming with nagano trypanosomes causes a disappearance of the organisms from the blood and prolongs the life of the animals. A combination with arsenic increases the action and often brings about a cure. For a certain time after the injections of brilliant green the blood of the treated animal is not infectious. As the trypanosomes are destroyed in the blood curious forms of the organism are found which have a cystic appearance. They are found principally in the spleen. The author believes it possible that these forms may have something to do with the life cycle of the organism.

HYGIENE AND PUBLIC HEALTH.

UNDER THE CHARGE OF

CHARLES HARRINGTON, M.D.,

ASSISTANT PROFESSOR OF HYGIENE IN HARVARD MEDICAL SCHOOL.

Preservation of Milk.—BEHRING, who advocates the treatment of milk for infants with formalin, has asserted that the presence of one part of the preservative in ~~4000~~ parts of milk makes no appreciable difference in the taste of the milk, which statement is denied by DR. LEO SCHAPS (*Zeitschrift für Hygiene und Infektionskrankheiten*, Bd. I. p. 247), who finds that in the proportion of 1 in 10,000 it causes an objectionable taste, which is perceptible when the proportion is as small as 1 in 40,000. While formalin checks the development of the lactic acid bacteria, its action upon staphylococci intentionally introduced was found to be far less marked, even when the proportion was raised to 1 in 5000, which strength was found to be not effective against tubercle bacilli placed in both raw and cooked milk. Behring's statements are controverted also by PAUL SOMMERFELD (*ibid.*, p. 153), who found that while formalin in the proportion of 1 to 5000 or 1 to 10,000 has a marked inhibitory influence on milk bacteria when the milk is kept at 50° to 60°, it has hardly any influence in diminishing their number after twenty-four hours, when the milk is kept at 65° and above. When the treated milk was kept at ordinary incubator temperature it yielded about the same number of bacteria per cubic centimetre as the control specimens. Pathogenic bacteria (typhoid and diphtheria) added to

sterilized milk were found to resist the influence of formalin, 1 to 5000, when the milk was kept at room temperature for twenty-four hours, and at incubator temperature for forty-eight hours.

Budde has proposed as a proper, efficient, and harmless method of sterilizing milk the addition of small amounts of hydrogen peroxide and warming to 104°. P. GORDAN'S (*Centralblatt für Bakteriologie*, etc., Nos. 22, 23, Abth. 2, Bd. xiii.) experiments show that the amounts recommended by Budde exert no appreciable influence. Larger amounts exert a marked inhibitory influence upon the lactic acid bacteria, but not infrequently streptococci and peptonizing bacteria are hardly affected. Only when three times as much as Budde advised is used, equal to 1.05 per cent. of Merck's preparation, are all the bacteria killed; but the disagreeable taste that it imparts makes its use impossible. M. LUKIN (*ibid.*, Bd. xv., No. 7) attributes the various adverse reports on the method to the use of the ordinary commercial preparations instead of the neutralized form. While he finds Budde's process effective, he agrees that the agent imparts a disagreeable taste which cannot be got rid of. E. BAUMANN (*Münchener medizinische Wochenschrift*, No. 23, Bd. lii. p. 1083) found that while the addition of hydrogen peroxide to the extent of 0.35 to 2 parts in 1000 greatly reduced the number of bacteria in ordinary market milk kept at 113° to 122° for two to three hours, in no case was complete sterility produced; but milk produced under the strictest sanitary conditions and similarly treated was found to be completely sterilized. Sterilized milk inoculated with the organisms of typhoid fever, dysentery, cholera, and tuberculosis, and treated with the agent in the proportion of 0.35 in 1000, and heated as above, remained sterile.

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DR. A. O. J. KELLY, 1911 Pine Street, Philadelphia, U. S. A.

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SPECIAL ARTICLES.

I.

TOXEMIC VOMITING OF PREGNANCY.

BY J. WHITRIDGE WILLIAMS, M.D.,

PROFESSOR OF OBSTETRICS, JOHNS HOPKINS UNIVERSITY, BALTIMORE, MARYLAND.

At the 1905 meeting of the American Gynecological Society I presented in abstract my views concerning the pernicious vomiting of pregnancy, and elaborated them in the *Bulletin of the Johns Hopkins Hospital*, March, 1906. Upon each occasion I stated that the evidence at present available seems to justify one in classifying the serious cases as reflex, neurotic, or toxemic, according to the etiological factors concerned.

In this article, I desire to consider toxemic vomiting more particularly; but before doing so I shall give, as briefly as possible, my reasons for recognizing each of the three varieties, and refer those who are interested in details to my monograph, in which the literature of the subject is exhaustively considered.

In the reflex variety the vomiting is apparently directly attributable to the existence of some abnormality of the generative tract, such as a retroflexion of the uterus or an ovarian tumor, and it ceases promptly upon its correction or removal. The fact, however, that in many pregnant women the presence of similar lesions is not associated with serious vomiting would apparently indicate that its reflex origin is quite exceptional, and suggest that some other etiological factor is usually concerned in its production. At the same time, the justification for the recognition of this type of

vomiting is afforded by those instances in which prompt cure follows the correction of the abnormality, while the failure of suggestive treatment and the lack of evidence of serious changes in metabolism make it improbable that the affection is neurotic or toxemic in origin.

In the neurotic variety the vomiting is apparently dependent upon the existence of a neurosis—more or less closely allied to hysteria—which may occur in women who had manifested no signs of impaired nervous control previous to the occurrence of pregnancy. In such cases careful examination will fail to reveal the existence of a single physical condition which could account for the vomiting, while the most accurate chemical analysis of the urine will afford no evidence of serious metabolic disturbance; and, finally, characteristic lesions will not be found at autopsy in the rare cases which end fatally, as such patients die from starvation.

Moreover, the neurotic nature of these cases is clearly indicated by the fact that cure frequently follows the employment of perfectly useless remedies and unphysiological procedures, such as a vigorous lecture on the part of the physician, dilating the cervix, or the application to it of various medicaments, applying leeches to the epigastrium, the employment of an exhausted electrical battery, or the administration of an anesthetic, etc. Still more convincing evidence is afforded by the fact that even the most obstinate cases of this character may be cured in a few days by instituting a rigorous rest cure in a well-conducted hospital; while less severe cases yield to suggestive treatment at home, if the patient's family are excluded from the room and the physician is sufficiently positive in his assurance that a prompt cure can be effected.

Toxemic vomiting, on the other hand, is a very serious disease, and is a manifestation of a profound disturbance of metabolism, of the exact origin of which we are ignorant. All that we know at present is that it usually ends in death, and sometimes leads to a fatal termination within a few days after the appearance of serious symptoms. In such cases the patient presents signs of a profound intoxication, and may die in coma without any evidence of starvation. In the last stages of the disease the vomited matter presents a coffee-ground appearance and is expelled without apparent effort.

The urine, while diminished in amount as the result of the scanty intake of fluids, does not contain albumin or casts until shortly before death, and may apparently present a normal amount of urea, as determined by the Dorennus method, so that its casual examination gives no clue to the gravity of the condition. In reality, on the other hand, more detailed chemical examination at an early period reveals changes which are indicative of a profoundly altered metabolism. These consist in a decided decrease in the amount of nitrogen excreted as urea, and a marked increase in the amount

put out as ammonia. Accordingly, while the total nitrogen output may be practically normal, the percentage of nitrogen eliminated as ammonia is greatly increased, and this so-called ammonia coefficient, instead of being 4 or 5 per cent. as in normal pregnancy, may rise to 20, 30, or 40 per cent., or even as high as 47 per cent., as in one of the cases reported in my previous article. Moreover, the proportion of amido-acids is increased, but we have not found crystals of leucin and tyrosin, as reported by Ewing in several instances. In some cases the acetone content is abnormally large.

Unexpected lesions are likewise found at autopsy, and Stone, Ewing, Straus, McDonald, and I have observed pronounced changes in the liver and kidneys. The former are closely allied to those occurring in acute yellow atrophy of the liver, and consist in the almost total destruction of the central portion of the liver lobules, the cells of which eventually become necrotic; while the cells in the midzonal and peripheral regions undergo marked fatty degeneration, so that only a few cells at the extreme periphery of the lobule retain a perfectly normal appearance. In the kidneys marked degenerative changes, sometimes amounting to necrosis, are likewise observed, especially in the convoluted lobules.

In view of the clinical history of such cases, and particularly of the characteristic urinary and autopsy findings, it is apparent that one has to deal with a condition totally different from that observed in the reflex and neurotic varieties, and that, therefore, it may be appropriately designated as toxemic vomiting.

In my monograph, I pointed out the extreme importance of differentiating the three varieties, both from the standpoint of prognosis and treatment. Accordingly, it is most essential in every case of serious vomiting of pregnancy to make an extended urinary examination and determine the total nitrogen and the ammonia coefficient. In my experience, if the latter exceeds 10 per cent. the diagnosis of toxemic vomiting should be made and the pregnancy immediately terminated, as there is apparently no likelihood that the process can be checked by therapeutic measures if it once leads to the production of the characteristic hepatic lesions. On the other hand, if the ammonia coefficient is approximately normal the probability of a serious toxemic condition can be eliminated, and the diagnosis will lie between the reflex and neurotic varieties; the latter should be diagnosticated unless some manifest lesions exist in the generative tract.

Likewise, too much stress cannot be laid upon the fact that it is not permissible to make a diagnosis of neurotic vomiting until the possibility of the existence of the toxemic variety has been eliminated by a careful urinary analysis; as in my experience, women suffering from the two conditions may appear equally sick as far as clinical symptoms are concerned. Consequently, the failure to

detect the toxemic character of the disease at an early period may result in the death of a patient, who might have been saved had the condition been recognized and abortion promptly induced.

Since writing my article last year, I have observed three additional cases of toxemic vomiting, which have served to confirm still more strongly my views concerning the radical difference between toxemic and neurotic vomiting, as well as the value of a high ammonia coefficient in diagnosing the former. Upon this occasion, I desire to report these cases briefly, and afterward to discuss their bearings upon the question of diagnosis as well as upon the nature of toxemic vomiting:

CASE I.—*Serious vomiting in two consecutive pregnancies—toxemic in the first and neurotic in the second.*

Mrs. M. S. (2310 and 2519), a twenty-five-year-old nulliparous patient, was admitted to the medical wards of the Johns Hopkins Hospital, September 10, 1905, having been sent by her physician with a diagnosis of catarrh of the stomach.

Previous to an attack of acute indigestion early in July she had been perfectly well, but from the latter part of that month until September 14th, when she was transferred to the obstetrical department, she had suffered greatly from nausea and vomiting, and had lost considerably in weight. On August 31st she vomited a teacupful of blood, and for several days afterward the vomitus was blood-stained. For some days before admission, and during her entire stay in the medical ward, she vomited every thing she ate, and was rapidly losing ground.

A provisional diagnosis of gastric ulcer was made, and the patient was about to be transferred to the surgeons for operation, when one of the medical men suggested that she was possibly pregnant, and in view of our work upon vomiting, thought that it might be interesting to determine the ammonia coefficient of the urine. This was estimated at 31 per cent. by the resident obstetrician, Dr. Goldsborough, and as the uterus was enlarged and soft and corresponded in size to a two and a half months' pregnancy, he diagnosed toxemic vomiting.

Accordingly, on September 14th, she was transferred to the obstetrical department, where all feeding by the mouth was stopped and nutrient enemata and large quantities of salt solution administered per rectum. The vomiting, nevertheless, continued and upon several occasions contained considerable quantities of blood. As the patient's condition was gradually growing worse the induction of abortion was deemed advisable, and was attempted on the evening of September 18th under ether anesthesia. The cervix, however, was so rigid that it could not be dilated by Hegar's or Goodell's dilators; accordingly, it was packed with sterile gauze and the patient was put back to bed. By noon the following day it had become so softened that it was readily dilated sufficiently to admit the index

finger, after which the foetus and its membranes were removed by ovum forceps.

The patient made an uninterrupted recovery, the highest temperature being 100.5°F . She did not vomit again after the operation, and twenty-four hours later expressed a desire for food, which she ate with relish. She gained rapidly in weight and left the hospital on October 3d in perfect condition.

Chart 1, *A*, gives a graphic picture of the rapid return to normal of the ammonia coefficient. It is interesting to note that the urine at no time contained albumin or casts.

The patient returned to the hospital, March 10, 1906, and stated that she was again suffering from vomiting of pregnancy. The last

CHART 1.

Ammonia coefficient.

*A**B*

CASE I.—Serious vomiting in two consecutive pregnancies—toxemic in the first (*A*, No. 2310, September 14 to October 2, 1905) and neurotic in the second (*B*, No. 2519, March 9 to 19, 1906).

menstrual period was January 17, 1906, and the vomiting had appeared on February 11th, and had been pretty constant ever since.

Examination showed that she was two months pregnant. She was paler and thinner than when she left the hospital in October and was evidently very nervous about her condition. She stated that for the past two weeks she had not been able to retain milk or any solid food, though she did not vomit other fluids.

As the urinary examination was negative, the ammonia coefficient varying between 3 and 7 per cent., a diagnosis of neurotic vomiting was made (Chart 1, *B*). The patient was put to bed, placed upon liquid diet, given no medicine, and was assured that she would recover promptly without the necessity of inducing abortion. After this

she only occasionally suffered from nausea, which soon ceased entirely, and within a few days she was able to enjoy a full ward diet and left the hospital perfectly cured at the end of ten days.

CASE II.—*Serious vomiting in two consecutive pregnancies—toxic in the first, neurotic in the second.*

Mrs. M. S. (2317 and 2524) was admitted to the hospital, September 20, 1905, at the request of her physician, Dr. C. N. Athey, with a diagnosis of pernicious vomiting of pregnancy.

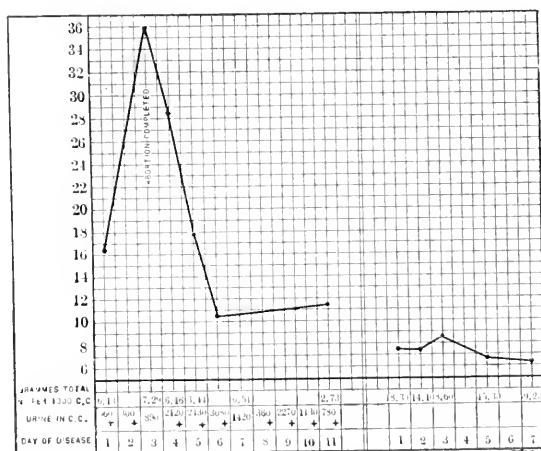
She was a twenty-one-year-old nullipara, who had menstruated last in May, 1905. Nausea appeared shortly after the non-appearance of the June period and continued ever since to a greater or less degree. For ten days prior to admission she vomited even the blandest fluid

CHART 2

Ammonia coefficient.

A

B



CASE II. Serious vomiting in two consecutive pregnancies—toxic in the first (A, No. 2317, September 21 to October 2, 1905) and neurotic in the second (B, No. 2524, March 16 to 23, 1906).

as soon as taken, and has gone down hill rapidly. She was treated by Dr. Athey for several days, but as she vomited every thing taken by the mouth, and could not retain rectal enemas, he advised her removal to the hospital.

On examination she gave the impression of being seriously ill, with lips dry and cracked, eyes somewhat sunken, pulse 120, but of fair volume and tension. The uterus was enlarged to the size of a four or five months' pregnancy. No other abnormalities were noted.

Immediately after admission she was put to bed, given nothing but cracked ice by the mouth, and received 400 c.c. of salt solution per rectum, as well as a nutritive enema every eight hours.

Chemical examination of the urine showed 17 per cent. of ammonia. In view of this and the fact that the symptoms grew worse in spite of two days' treatment, the induction of abortion was determined upon. Accordingly, a medium-sized bougie was introduced into the uterus on the 22d. Upon its removal later in the afternoon the cervix was found to be soft, and under ether anesthesia was readily dilated sufficiently to admit the index finger. The membranes were then ruptured and the fœtus and placenta removed piecemeal by ovum forceps and the uterus washed out with sterile salt solution.

The patient made an uninterrupted recovery and vomited but once after being put back to bed. She asked for food the morning after the operation, and was discharged twelve days later in excellent condition.

As shown by Chart 2, *A*, the ammonia coefficient reached 37 per cent. the day of the abortion, but rapidly fell to 10 per cent. four days later. At no time did the urine contain albumin or casts.

The patient was readmitted March 15, 1906, when she was found to be between two and three months pregnant; last period January 11, 1906. She had been perfectly well up to March 7th, when without any known cause she began to vomit a greenish fluid. Since then she has rejected every thing she has eaten and has vomited almost continuously day and night.

On admission the patient was extremely nervous and very anxious about herself. She had not taken food of any description for two days. The pulse and temperature were normal. She was immediately put to bed and placed upon rectal feeding, and she was earnestly assured that her condition was not serious.

The urinary examination was negative and the ammonia coefficient was 6 to 8 per cent. (Chart 2, *B*). Vomiting ceased after the first twenty-four hours; the next day she asked for food and was put on a soft diet, the enemas being discontinued. She steadily improved and left the hospital one week after admission in excellent condition without having taken a dose of medicine of any kind. One month later she reported that there had been no recurrence.

CASE III.—*Toxemic vomiting of pregnancy.*

Mrs. E. C. (2351), a thirty-one-year-old III-gravida, was seen in consultation, October 13, 1906, when I obtained the following history: Married seven years. Spontaneous labor in March, 1901, the child dying three days later from hemophilia. Suffered intensely from nausea and vomiting during the first half of gestation.

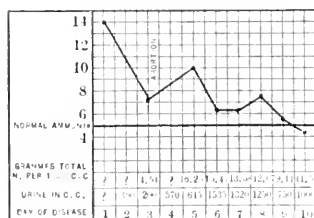
The second pregnancy began in October of the same year, and was marked by still more severe vomiting than before. It became more intense during the fifth month, when she vomited large amounts of coffee-ground material without apparent effort. A few days later she suddenly became jaundiced and profoundly comatose, and her condition was so serious that Dr. Haven, of Boston, who

delivered her by accouchement forcé, despaired of a favorable outcome. She, however, made a satisfactory recovery, and has been perfectly well until the present illness.

The last menstrual period preceeding her third pregnancy began August 26, 1905, and morning sickness appeared on October 1st. At the end of a week it had become so severe that she was constantly nauseated and vomited every thing she took. When I saw her on October 12th she was tossing from side to side in bed, vomiting small quantities of clear fluid at frequent intervals, and complaining of intense headache. She had not slept for several nights, and impressed me as being seriously ill. Her face was drawn and haggard, and the pulse varied between 100 and 110, while the temperature was normal.

I at once ordered a twenty-four-hour specimen of urine saved, and in the meantime did not attempt to feed by the mouth, but relied upon rectal enemas. This had no effect upon the vomiting, nor did suppositories of codein and hyoseyamus relieve the nervous condition or induce sleep.

CHART 3



CASE III. Toxemic vomiting of pregnancy (No. 2351, October 15 to 24, 1905).

The report upon the urinary analysis, which was received on the 15th, showed an ammonia coefficient of 14 per cent., a few hyaline casts, but no albumin. In view of this, together with the history of the previous pregnancy, I regarded her condition as very serious; but as she was decidedly opposed to any interference, I determined to await developments before urging the induction of abortion. I did not have to wait long, as the next day the vomited matter became blood-stained, and she complained of intense pain in the hepatic region, but presented no jaundice. I accordingly urged the necessity for immediate interference, and sent her to the Johns Hopkins Hospital on the morning of the 17th.

Under ether anesthesia the cervix was easily dilated sufficiently to admit a finger, and the uterus cleaned out with ovum forceps and a dull curette.

The nausea and vomiting persisted for two days following the operation, after which recovery was uneventful, the highest temperature being 99.5° F.

I saw the patient again on January 8, 1906, when she desired to know if it would be safe for her to become pregnant again, as she was most anxious for a child. In view of the serious condition in the last two pregnancies, I carefully investigated the hepatic function and found that 100 grams of levulose could be taken without giving rise to insufficiency; while a twenty-four-hour specimen of urine showed 7.84 grams of total nitrogen and an ammonia coefficient of 5 per cent. Accordingly, I stated that I could find no reason to forbid the possibility of pregnancy, though I naturally declined to express an opinion as to its outcome.

The three cases here reported are of very considerable interest in themselves, but when taken in connection with the four cases of toxemic vomiting described in my monograph, they are of the greatest possible value in establishing the diagnostic value of a high ammonia coefficient and its importance as an index to treatment.

Cases I and II demonstrate as clearly as possible the difference in metabolism in the toxemic and neurotic varieties of vomiting. Both patients presented a high ammonia coefficient in their first, and a low one in their second, pregnancies. The first illness was most serious and demanded the interruption of pregnancy, while the second was of but slight importance and yielded readily to suggestive treatment, without the use of medicine. Nevertheless, both patients considered themselves seriously ill when they returned to the hospital for the second time, and had we not been able to differentiate between the toxemic and neurotic conditions by means of the urinary examination it is scarcely probable that we could have been so convinced of the neurotic nature of the second illness as to permit us to assume the authoritative tone so necessary to success in suggestive treatment.

These cases are likewise of importance as showing that toxemic vomiting does not necessarily recur in subsequent pregnancies, and that the hepatic lesions, which we assume accompany it, are capable of repair, or at least do not always lead to serious impairment of function, provided pregnancy is promptly terminated.

Case III, on the other hand, is not so encouraging, for, as far as we can judge from the history, the second pregnancy was complicated by toxemic vomiting, or possibly by acute yellow atrophy of the liver, while there can be no doubt as to the nature of the illness just described. Such a recurrence would apparently indicate that even after a period of three and a half years an anatomical lesion, or at least a predisposition to serious disturbance of metabolism, had probably persisted. But whatever may have been the case in this particular instance, our experience in Cases I and II has clearly demonstrated that recurrence is not universal; and possibly further observation may show that, just as in eclampsia, one attack confers an imperfect immunity in subsequent pregnancies.

From the observations just adduced, I feel that the evidence at present available clearly demonstrates the diagnostic value of a high ammonia coefficient; and whenever it rises appreciably above 10 per cent. in a woman suffering from pernicious vomiting of pregnancy, it indicates a serious disturbance of metabolism, which demands the prompt termination of pregnancy, in the hope of interrupting the process before the organic lesions have become so developed as to preclude the possibility of recovery.

At the same time I do not wish to be understood as contending that a high ammonia coefficient can only occur in this condition, as I know perfectly well that such is not the case.

Several of my friends have suggested that possibly the condition of the urine might be merely a manifestation of starvation resulting from the incessant vomiting, as Folin and Möner have noted corresponding changes in cases of starvation not associated with vomiting. The plausibility of such a contention must be admitted, and one is obliged to confess that its direct refutation is very difficult. Nevertheless, it seems to me that very strong negative evidence is afforded by clinical observation. Thus, one may see two women, both of whom are apparently equally ill and actually suffering from starvation as the result of absolute inability to retain nourishment of any character, and yet one will present a high and the other a low ammonia coefficient. This being the case it would seem very unlikely that starvation could be the only factor concerned.

In view of the fact that chloroform was used as an anesthetic in several of my previously reported cases, which ended fatally, the question arises as to whether some of the symptoms at least might not be attributed to an acid intoxication following late chloroform poisoning, as in several of the cases recently reported in the literature. Such a possibility must be considered, but is most unlikely, as in the three cases here reported, ether was the anesthetic employed.

Dr. C. G. L. Wolf, of the Cornell Medical School, in a recent article upon toxemias of pregnancy, has suggested that the urine of stout women is particularly prone to present a high ammonia coefficient, which should be attributed to abnormal fat metabolism, and has ventured to suggest that such was the case in some of my observations. No doubt he is quite correct in his general statement, but some other cause must be invoked to explain the high ammonia coefficient in most of my cases, as five of my seven patients were thin or emaciated, and only two well nourished, though neither of them could be designated as stout.

While it is possible to speak thus positively concerning the diagnosis of toxemic vomiting, I regret that I am unable to throw further light upon the ultimate nature of the condition than in my previous article.

I have already referred to the liver lesions noted at autopsy, and

the evidence as to their frequency and constancy is rapidly accumulating. In addition to the twelve cases collected in my article, which include those observed by Stone, Ewing, and myself, similar observations have been made by McDonald and Strauss during the past few months. Notwithstanding this, however, we are not in a position to state positively whether the metabolic changes result directly from the liver lesions or represent an attempt on the part of nature to neutralize an acid intoxication, or whether we have to deal with some other process concerning whose nature we are as yet absolutely ignorant.

Personally, I believe that the lesions in the liver are not the primary factor, but result from the circulation of some substance in the blood which has already caused the metabolic disturbance. This view, of course, does not preclude the possibility that the development of such lesions may still further accentuate the existing metabolic abnormality.

The practical identity of the hepatic lesions, as well as the similarity in the clinical history of toxemic vomiting and acute yellow atrophy occurring in pregnancy, force one to the conclusion that the two processes are closely related, if not identical. Thus far I agree with the teachings of Ewing, Stone, McDonald, and Strauss; but I cannot follow them in holding that the conditions just mentioned as well as the pre-eclamptic toxemia, eclampsia, and various other abnormalities of pregnancy, are merely modifications of one and the same toxemia.

At first glance it might appear that such an assumption would simplify matters and lead to their more ready comprehension by physicians in general. To my mind, however, such a belief is absolutely erroneous, and can result only in still further confusion in a field which is already sufficiently dark and complicated. To my mind pre-eclamptic toxemia and eclampsia differ as markedly from toxemic vomiting and acute yellow atrophy of the liver as lobar pneumonia differs from acute miliary tuberculosis. No doubt the clinician may occasionally confuse the two conditions, and designate as eclampsia acute yellow atrophy which has resulted in death in coma and convulsions. Such a mistake is perfectly comprehensible at the bedside, but it is without justification in the autopsy-room, as a careful study of the specimens will reveal lesions which are absolutely different.

In eclampsia and pre-eclamptic toxemia, one finds perfectly characteristic lesions, which are thrombotic in character and originate in the portal spaces; while in toxemic vomiting and acute yellow atrophy one finds necrotic lesions in the central or midzonal areas of the liver lobules. The changes in eclampsia are thoroughly characteristic, so much so that I should not hesitate to diagnosticate it whenever I found them, no matter what the clinical history. On the other hand, convulsions, while usual, do not always occur

in eclampsia. Schmorl has described characteristic eclamptic lesions in women dying in coma without convulsions, and I have seen two similar cases.

Moreover, when one takes into consideration the clinical history and the urinary findings in the two conditions, the case becomes still more convincing. In pre-eclamptic toxemia there is usually marked evidence of renal impairment, with scanty urine, casts, and albumin, and usually oedema, and the same generally holds good for eclampsia. In toxemic vomiting, on the other hand, the apparent urinary changes are in the background and the characteristic manifestations are in the nitrogenous partition of the urine and in the profound nervous involvement. Moreover, in eclampsia, in my experience, a high ammonia coefficient usually indicates a favorable outcome, while in toxemic vomiting it is of most ominous prognostic significance.

While we must admit that our information concerning all of these conditions leaves a great deal to be desired, we, nevertheless, know something of them. On the other hand, we occasionally meet with conditions about which we know absolutely nothing. Thus, during the last three years, I have seen several women a day or so after delivery pass into coma, in which they remained for several days, and then gradually recovered, without having had a convulsion. The urine did not contain albumin or casts, and careful chemical examination failed to show any serious derangement in the nitrogenous partition.

The most natural inference is that they were due to a toxemia of some kind, but I do not believe that the cause of science will be served by grouping them into a single class with the other toxemic affections. What we desire to learn is something more as to the true nature of such conditions, and to my mind, advance will only be delayed if such a classification is adopted. I feel that there is no more justification for so doing than to attempt to place all varieties of septicemia in a single group; and surely no one would advocate such a retrograde step.

I believe we should recognize that there are various toxemias of pregnancy, and while we know something about several of them, it is possible that other varieties exist of which we know absolutely nothing at present. Accordingly, the only means by which we can hope to advance is by grouping our cases together according to their anatomical and chemical characteristics, and by waiting for the future to show us the significance of those conditions about which we now know little or nothing, in the hope that we may eventually learn how to classify them.

II.

ELEPHANTIASIS NERVORUM OF THE SCALP: A MANIFESTATION OF VON RECKLINGHAUSEN'S DISEASE.

By H. F. HELMHOLZ, M.D.,

FELLOW IN PATHOLOGY, JOHNS HOPKINS UNIVERSITY, BALTIMORE.

AND

HARVEY CUSHING, M.D.,

ASSOCIATE PROFESSOR OF SURGERY, JOHNS HOPKINS UNIVERSITY, BALTIMORE.

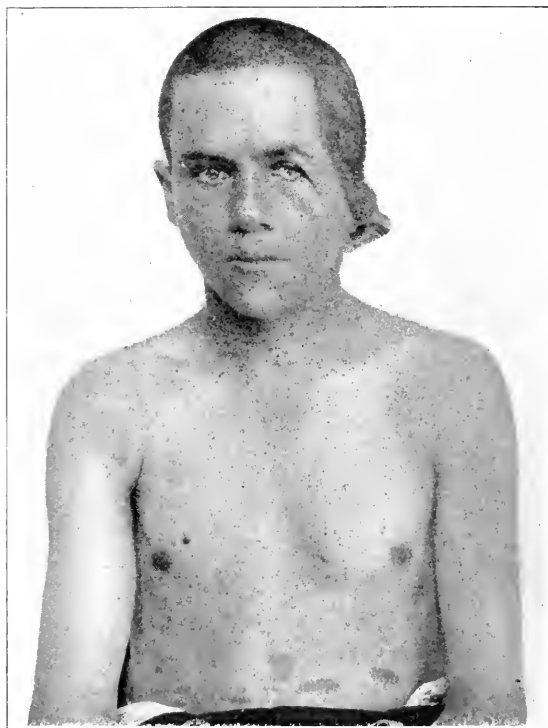
THE wisdom of designating maladies, or some of their essential features, by the name of the investigator who first called particular attention to them is contestable. Occasions arise, however, when it is not only a deserved tribute, but a matter of convenience as well. There are few instances in which an individual's name is thus more appropriately linked with a condition of disease than is von Recklinghausen's, for it was he who first demonstrated the histogenetic unity of the morbid changes underlying what had before been considered a number of diverse processes, many of which, owing to their striking and obtrusive nature, had long been known and described under a number of terms. A majority of the terms thus introduced have been descriptive of one or more of the kaleidoscopic features of the malady which now by common consent bears von Recklinghausen's name, but no one term as yet proposed seems to have received general acceptance, generalized neurofibromatosis possibly being as satisfactory as any.

This disease, which, as Feindel has said, is "*congénitale toujours, héréditaire souvent, et quelquefois familiale*," has for its most constant features certain skin manifestations. These consist chiefly of points or patches of pigmentation, of multiple isolated superficial tumors (*molluscum fibrosum*), and occasionally of large diffuse growths. In addition to these surface lesions, or indeed in their total absence, there may be multiple tumors distributed along the course of a single nerve or even involving the branches of an entire plexus. These neuromas are often palpable under the skin, but in spite of their size and multiplicity they rarely give rise to pressure phenomena by interrupting the transmission of nervous impulses unless they develop from the nerves during their intraspinal or intracranial course, when compression disturbances of various kinds may arise. Then there occur many so-called symptoms of a secondary order, the evidence of which is less objective: vague sensory disturbances, simple-mindedness, deterioration in mentality, epilepsy, etc.

The patient whose condition we wish to record presented, in addition to many of the commoner features of the disease, a rela-

tively unusual type of diffuse, superficial tumor formation, and the growth, occurring as it did upon the side of the head, was so unsightly that it brought him to the hospital for surgical treatment. Not until we inquired into the matter did we learn that this is by far the more common site of development for these tumors, and the finding has led us to bring together a number of these cases and to present them as a background for our own, the history of which is as follows:

FIG. 1



Front view of the patient, showing deformity of the scalp; also areas of pigmentation and other skin lesions over the body.

Thomas P., aged nineteen years, an American, a laborer, was referred to us by Dr. L. P. Hamburger in November, 1905. His complaint was "drooping of the scalp."

Family History. His parents, three sisters, and three brothers are living and well. He is unaware of the existence of any similar trouble in any member of the family, and thinks none of them have any cutaneous blemishes whatsoever.

Personal History. He has always enjoyed good health, and does not recall any of the diseases of childhood. As long as he can

remember he has had areas of brown pigmentation and numerous small soft tumors distributed over the body. He does not think that any new ones have appeared during the last few years. It was ascertained from the patient's mother that upon the left temporal region, the seat of the present growth, a large "brown spot" had been present for several years before the skin began to sag. She could not tell whether or not it had been present at birth.

FIG. 2



Side view of the patient, showing displacement of the ear and the outer canthus of the eye.

When seven years of age, while playing in the street, he was run over and was struck by the horse's hoof, on the left side of his head. The skin was not broken, but the scalp was severely bruised.

About a year after this injury the patient thinks the present tumor began to develop. No subjective symptoms accompanied the growth, and as a matter of fact his attention was first drawn to it by his friends, who noticed that his left ear was becoming somewhat lower than the right. This drooping of the ear and sagging of the scalp during the next four years progressed quite rapidly, so much

so that the scalp covered part of the left cheek, and the ear stood out at right angles from the head. For the past seven years the patient thinks the growth has been slower. At no time has there been pain or sensory disturbances of any sort associated with this growth. He thinks that hearing in the left ear has become slightly impaired.

Physical Examination. The patient is a listless, undersized young man, who would be taken for a boy of fourteen rather than for a person of his real age. His face is not indicative of a high order of mentality. Although he has attended school, he has never learned to read or write.

On the left side of the head (Figs. 1 and 2); extending from the external margin of the orbit to the occiput, and from a point 2 cm. from the sagittal suture to the left external auditory meatus, there is a soft flabby tumor mass which hangs down from the crown, carrying all of the superficial structures with it. It is very readily movable and slides freely over the underlying bony surface without any evident attachment whatsoever. Palpation of the mass imparts the peculiar sensation which Valentine Mott has likened to a relaxed and emaciated mamma. The scalp sags down over the cheek, so that about one-half of it is covered by hair. The skin of the forehead has been drawn down over the external angular process, carrying the outer canthus with it, partly closing the palpebral cleft, and giving the opening a decidedly downward tilt. Over the crown of the head the tumor is less freely movable than in its more dependent portions. It forms on the side of the face a fold extending from the outer margin of the orbit back to the external auditory meatus. The ear has been crowded so far downward that the tip of the pinna is on a level with the lobe of the opposite ear; it has also been displaced slightly backward, and instead of being parallel to the side of the head the pinna stands out perpendicularly to it. Just above the ear there is a large mass within which several knotted cords can be palpated. The tumor is so freely movable that by picking up a large fold of the redundant tissue over the parietal region and pulling it upward and backward the face can be restored almost to its normal outline. The scalp over the tumor is greatly thickened, its surface roughly papillated, and in several areas covered by patches of brownish pigmentation. The hair over the tumor is thinned out and in many follicles only short broken stumps of coarse hair are to be seen. Many of these hairs are without pigmentation. The patient's beard has not as yet developed; merely a few downy hairs are to be seen.

There seems to be some slight atrophy of the temporal muscle under the tumor with relaxation of its fascia, for the index finger can be readily introduced for some distance behind the zygoma. Posterior to and somewhat below the level of the ear are two smaller tumors having the same brownish color and the same consistency

as the larger tumor mass. They measure about 3 x 4 and 2 x 3 cm. respectively. During the examination slight spasmodic twitchings of the facial muscles were seen to occur.

Over the thorax and abdomen the skin shows a variety of lesions. Scattered quite profusely over the trunk, and the extremities as well, are small areas, pin-head in size, of brownish pigmentation. There are also larger patches of pigmentation of irregular outline (Fig. 1), the larger ones occurring upon the chest, the smaller ones scattered over the body, even upon the hands and fingers. There are no patches upon the palms. There is no evidence of segmental distribution in the topography of these patches. Especially over his chest and flanks are scattered numerous slightly

FIG. 3



FIG. 4



The condition after preparation for operation, to show drooping of the scalp, with displacement of the ear and the outer canthus, and replacement of these on gathering up a fold consisting of the main part of the tumor growth.

elevated bluish discolorations, resembling minute bruises. Over the chest and back also are numerous so-called spider angiomas. Many small moles, both sessile and pedunculated, are scattered over the body. His back in particular is peppered with these small growths. Finally, on the chest, one arm, and one leg are a few characteristic soft fibromas. These latter tumors are all of the same general character, of a brownish color, slightly raised above the surface, soft and compressible, giving the characteristic seedless-raisin feeling when examined. They measure on an average about 1 cm. in diameter.

A careful examination of the palpable nerves of the extremities discloses no irregularities in their structure. In only one place

are any definite neuromas of nerve trunks found. These are associated with the large tumor, and will be described later.

Operation under ether November 9, 1905. The accompanying photographs (Figs. 3 and 4) of the patients head were taken by Dr. Gilman, after he had been shaved in preparation for the operation.

After cleaning up the scalp, and while palpating the temporal vessels to determine whether a tourniquet could be so applied as to shut off the extracranial blood supply, the operator found a nodule the size of a bean lying just above the zygoma in front of the ear, evidently upon the auriculotemporal branch of the fifth nerve. Above this nodule could be felt a chain of others, running out into the tumor mass. Consequently, before attacking the tumor proper an incision was made over this region and the primary nodule, while the secondary ones lying above it were dissected out, the temporal artery being ligated at the same time. The tissues were found to be soft, almost gelatinous, and exceedingly vascular, so that some difficulty was experienced in checking hemorrhage even in this small wound. It was closed by deep mass sutures.

The flap of scalp which was to be removed was then pulled up so as to restore slightly more than the natural position of the ear and the horizontal position of the palpebral cleft. A tourniquet was then applied, holding the scalp in this position. The proposed area of tissue for removal was then marked out with the scalpel by a superficial scratch through the epidermis. The incision extended from a point near the external angular process nearly to the occipital protuberance, and included an area of skin on its surface about 15 cm. in cross diameter. It is well that we took this precaution, because from the first deep incision the bleeding was so profuse that had this preliminary step not been taken it is probable that just the right amount of tissue to ensure a successful plastic result would not have been removed, owing to the confusion which the abundant hemorrhage occasioned. As rapidly as possible the incision was carried down through the scalp to the cranial aponeurosis, and as the tissue was dissected away from before backward, the edges of the wound were brought together en masse by a continuous Pagenstecher suture. No vessels were ligated, for we found that the clamps pulled out of the soft tissue by their own weight as rapidly as they were put in. It was only by this taut closure of the wound that we succeeded in controlling the bleeding. The edges of the incision were then more leisurely approximated by interrupted fine silk sutures. No atrophy or change in the bones or the pericranial tissues was disclosed during the operation.

Though the patient lost an amount of blood during the operation sufficient to leave him somewhat anemic for a time, he made a rapid and satisfactory recovery. At one point the sutures in the scalp had failed to check the bleeding completely, so that a small

hematoma formed underneath the edge of the incision. When the sutures were removed some days later this clot broke through and left a point which healed slowly by granulation. The practical restoration of the eye and ear to their normal position is shown in the accompanying photograph (Fig. 5). It is quite possible that there may be a recurrence of the growth, particularly as the two isolated masses resembling the original tumor and lying over the mastoid process were not removed with the spindle-shaped piece of tissue taken away at the operation. For a few weeks after the operation the angle of the eye and the ear were drawn up into a position somewhat higher than on the opposite side, but this overcorrection of the pre-existing deformity has gradually disappeared.

FIG. 5



Postoperative condition, to show restoration of the eye and the ear to practically the normal position.

Pathological Findings. The tissues for examination were a neurofibroma removed by a separate incision from just above the left ear, and a diamond-shaped piece of scalp from the left parietal region.

The neurofibroma measured 1.8 x 0.8 x 0.6 cm.; it was soft and elastic, and of a dull-gray color. The surrounding tissue readily stripped from its capsule, leaving a smooth and glistening surface. Toward one end there was a small sulcus which indefinitely divided the tumor into two lobes. The nerve trunk proximal to the neurofibroma was uniformly thickened as far as it had been removed; the nerve distal to the tumor was of smaller diameter, and it emerged

from the main lobe (Fig. 6). On fresh section the tumor was translucent, smooth, rather œdematous, and of a yellowish-gray color. Running through its centre was to be seen a more opaque, whitish band, striated transversely, and at one point sending off a branch into the other of the two lobes. The capsule was everywhere well defined.

Microscopically, the neurofibroma is found to be made up for the most part of a loose connective tissue. It consists of interlacing strands of fibers forming a very fine network, the meshes of which appear almost like vascular spaces. This loose tissue varies considerably in its cellular contents; in some areas it is almost entirely fibrous, and in others very cellular. Through the centre of the tumor there passes a dense band of connective tissue, in the wavy outlines of which the nerve fibres can be demonstrated.

The central strand is made up principally of spindle-shaped cells with large vesicular nuclei. The looser tissues consist of finer drawn-out cells with solid, dark-staining nuclei. Occasionally very large vesicular nuclei are to be seen. There are very few cells of the wandering-cell type, although an occasional group of young

FIG. 6



Sketch of the neurofibroma from the auriculotemporal branch of the fifth nerve.
(Actual size.)

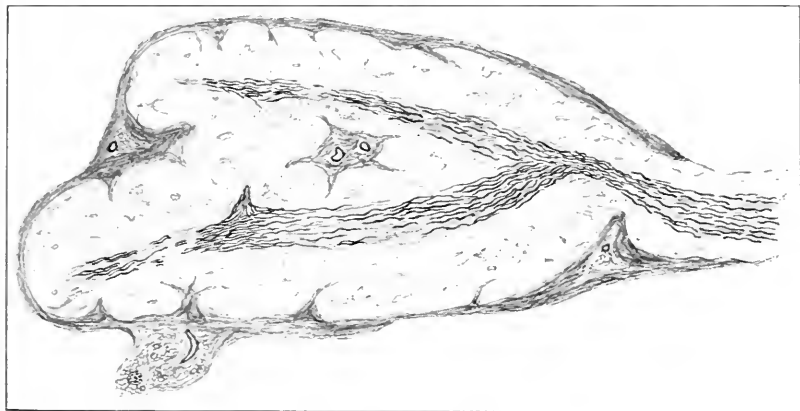
fibroblasts resembles them very closely. Though there are but few vessels in the tumor itself, the vascular supply of the capsule is abundant, and several tags of adherent tissue prove to be of the same type as the tissue which makes up the greater part of the thickened scalp.

With Mallory's connective-tissue stain the central cord stands out very prominently, and among the blue connective-tissue fibers a few yellow-stained nerve fibers can be made out. Sections stained with Weigert's elastic-tissue stain gave negative results. The specific stains used to demonstrate the nerve fibers were Weigert's myelin-sheath stain and Robertson's modification of Heller's stain. The latter stain, on account of its more definite color contrast, was used in the great majority of the preparations. A series of sections taking in the entire diameter of the neurofibroma was stained. The series shows that there are two main strands of nerve fibers running through the tumor mass, about as they are indicated in Fig. 7, which does not represent any one section, but a composite of one near the beginning and one near the end of the series, in

order to bring out in a clearer manner the course of the fibers. As can be seen in the sketch, the greatest part of the tumor is due to a proliferation of the perineural connective tissue, but judging from the distance which separates the individual nerve fibers there has been considerable proliferation of the endoneurium as well. The amount of endoneurial thickening varies considerably in different parts of the tumor. The fibers of the entering nerve are quite widely separated, while the nerve leaving the tumor shows some perineural thickening, but the nerve fibers themselves form a compact bundle. The point at which the second band of fibers leaves the tumor corresponds to the small lobe that was made out in the gross. The nerve evidently was cut off short. The individual nerve fibers, both large and small, appear perfectly normal.

Scalp. In its shrunken condition after hardening the portion of scalp removed measured 15.2 x 7.5 cm. Its thickness varied

FIG. 7



Longitudinal section of the neurofibroma pictured in Fig. 6. (Robertson's modification of Heller's stain.)

from 0.5 cm. at the periphery to 1.2 cm. in the central areas. The epithelial surface was irregular, due to marked papillary formation about the hair follicles. This was especially apparent in those areas where brownish pigmentation was most abundant. The cranial surface was rather ragged in appearance, and the tissue was quite uniformly soft, oedematous, and of a yellowish-red color. It had a peculiarly flabby feel to it. At the posterior inferior corner of the spindle-shaped piece of tissue there were found several nerves which showed nodular thickenings. One of these thickenings measured 1.4 cm. in length by 0.2 cm. in diameter. These were the only neurofibromas seen on inspection, and are indicated at *a*, in Fig. 8.

The thickening of the scalp was due almost entirely to oedematous connective tissue, which after hardening in formalin was quite

tough and could be readily pulled off in sheets, and sometimes also in small cords that resembled nerve fibers. In the areas of greatest thickening the nerves and neurofibromas were no more abundant than elsewhere.

On cross-section of the scalp the tissue presented a uniform fibrous appearance. The hair follicles were enlarged and extended in some areas three-fourths of the distance through the scalp. About them there was a small ring of fibrous tissue. The bloodvessels that were cut in different sections were not loose in the subcutaneous tissue, and a definite wall could not be dissected out, but were firmly embedded in the fibrous tissue. One vein was cut longitudinally for a distance of about 2.5 cm. It did not collapse, but remained open its entire length, looking like a small trough. In

FIG. 8

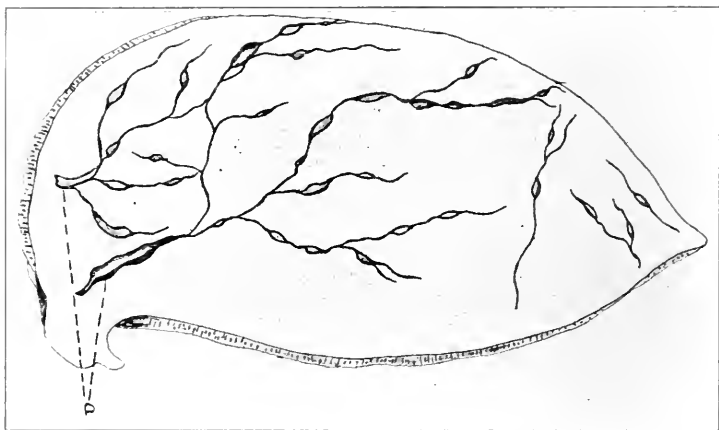


Diagram of the neurofibromas, dissected out in the removed portion of the scalp.

attempting to free it from the surrounding tissue it was torn, but could not be dissected free.

On carefully dissecting out some of the nerve twigs found on the under surface of the scalp numerous small neurofibromas were found. These tumors were all of about millet-seed size, scattered irregularly along the different nerves, as shown in Fig. 8. They were most abundant just beneath the corium, lying between the hair follicles (Fig. 9). The nerve fibers became so fine in this layer that after the cluster of neurofibromas was dissected out it was almost impossible to follow them further. In one instance after a nerve had divided into two branches a neurofibroma on one of its branches, about 0.5 cm. beyond the division, enclosed the other branch as well. The smaller tumors had the same cross-striation that was seen in the central cord of the neuroma described

above at some length. In every instance the neurofibromas, owing to their definite encapsulation, could be readily shelled out from the surrounding fibrous tissue.

On microscopic examination of the scalp the most marked change to be noted is the great increase in cellular connective tissue in the subcutaneous layer. This tissue shows no definite arrangement, but consists of dense, irregular masses, chiefly in the lower layers of the *tela subcutanea*. In many areas also the normal fibrous corium is replaced by this same cellular connective tissue, which in many spots may extend even as far as the epithelium itself. The tissue consists of fibroblastic cells with relatively large vesicular nuclei, that run in bands, layers, or form an irregular network. Numerous "mast-zellen" are scattered through the connective tissue. The subcutaneous tissue contains a considerable amount of fat, which also has been invaded by the sclerosing process, for the alveoli are separated by thick strands of fibrous tissue.

Sections stained with Weigert's elastic-tissue stain demonstrate very clearly that the portion of the scalp below the corium is relatively free from elastic fibers. Throughout the *pars reticularis* and *papillaris* of the corium itself, however, a fine tracery of elastic fibers can be demonstrated. At numerous points small strands of tissue containing elastic fibers extend from the corium for short distances into the subcutaneous tissues. In the *tela subcutanea* proper the elastic fibers are very poorly developed; only here and there are seen a few small scattered fibers. In the lowest portion an occasional fiber is seen.

The epithelium is normal in appearance, except for its unevenness, which was noted in the gross. Underlying the epithelium the cells contain some yellow pigment, as do also the wandering cells in the spaces of Lange. The corium, except for the invasion of fibrous tissue from below, also appears normal.

The hair follicles are larger than normal, dipping deep down into the subcutaneous tissue, and the connective tissue about them is increased in amount. The sebaceous glands are also proportionately enlarged. The sweat glands are not increased in size or number, nor are there to be seen any finger-like processes growing into the subcutaneous tissues, such as von Recklinghausen described. The capsules of the glands are slightly thickened.

The lower layer of the subcutaneous tissue is quite vascular. The walls of the vessels do not stand out distinctly, as is the rule in connective tissue, but they are firmly embedded and seem fused with the cellular connective tissue about them. This is especially well seen in some of the larger veins, in which the wall proper cannot be distinguished from the concentrically arranged connective tissue, which at certain points seems almost to make up the entire wall. The elastic tissue in the vessel walls seems normal.

The neurofibromas were very infrequent in the different sections

taken from the scalp, though numerous nerves were seen, showing slight increase in the size of their perineural sheaths. One of these neuromas is shown in Fig. 9. The nerves, as well as the tumors upon them, are definitely separated from the surrounding fibrous tissue, sometimes even by a small interval. Thus, the interlacing fibrous tissue cells of the nerve sheath are quite distinct from the surrounding tissue which possesses the same histological character. The nerve fibers in the small subcutaneous tumors are few and run irregularly through them, so that very probably there has been a proliferation of the endoneurium as well as of the perineurium, a condition similar to that found in the larger neuroma first described.

FIG. 9



Miliary neurofibroma in a section of the scalp. (Robertson's modification of Heller's stain.)

Just why the trigeminal field and the temporal region in particular should be the seat of predilection for these growths is not apparent. Bruns, in his review of these cases, found that more than a third of the so-called "Rankenneuromata" originated in this territory. The tumors are painless, and troublesome only because of their unsightliness and the great size which they may attain. Hence, it is natural to suppose that they will more often lead their hosts to seek surgical relief when they occur upon an exposed part of the body than when they are hidden from sight. But even this does not suffice to account for the great predominance of the temporal cases. They are, furthermore, much more common in men, as the subjoined list indicates.

Only one of the several patients afflicted with von Recklinghausen's disease who have been admitted to the various services at the Johns Hopkins Hospital has possessed an elephantiac growth of this nature. This was a woman with all the hall-marks of von Recklinghausen's disease, in whom an enormous tumor mass hung from the right side in much the same position and of about the same proportions as in the case depicted by Virchow as a frontispiece to *Die Krankhaften Geschwülste*, vol. i. This, after the temporal region, is perhaps the second most frequent seat of origin for these tumors.

Although these large isolated growths are almost invariably accompanied by other manifestations of von Recklinghausen's

FIG. 10



Valentine Mott's case of "pachydermatocele."

disease, the tumors themselves have come to be designated by a most variable terminology. In his classical monograph, von Recklinghausen himself adheres to the term *elephantiasis mollis*, used by Virchow. Mott designated the growths *pachydermatocele*. Verneuil introduced the terms *plexiform neuroma* and *neuroma cylindricum plexiforme*. Among other designations are *elephantiasis molluscum* (Nélaton); *rankenneurom* and *neuroma circoideum* (Bruns); *dermatolyse* (Marie); *elephantiasis neuromatodes* (Bruns); *lappen-elephantiasis* (Esmarch); *cylindrisches fibrom* (Marchand); *fibroneuroma racemosum* (Rizzoli); *tumeur royale* (Boudet), etc.

In his monograph von Recklinghausen cites one or two cases which appeared in the literature before 1854, but possibly it may

be well to begin our report with the cases which were recorded by Valentine Mott.

1854. Valentine Mott. "Tumors of Skin Denominated Pachydermatocele," *Med. Chir. Trans.*, London, 1854, vol. xxxvii, p. 155.

Case III of his series. A boy, aged fourteen years, consulted him because of a "hideous deformity" on the right side of his head and face. The tumor formed three layers, extending from the crown of the head to below the jaw. One fold involved the upper eyelid, and when raised revealed the globe at the end of a canal four inches in depth (Fig. 10). The tumor was twice operated upon, but the growth recurred after each operation.

FIG. 11



Billroth's Case of "plexiformes neuroli brom."

Case IV of his series. A boy, aged twelve years, presented a swelling on the right side of the face which began in early infancy and was probably congenital. Its description corresponds exactly to the case cited above. The operation was successful and there was no return of the growth during the following six years.

It is to be noted that Mott limited the description in these cases to the tumor lesion alone, and he makes no reference to the presence of other skin manifestations which we now include under the term von Recklinghausen's disease.

1863. Billroth. "Ueber die Entstehung der Fibroide," *Archiv f. klin. Chir.*, 1863, Band iv, p. 547.

A boy, aged six years, presented a tumor consisting of small,

hard strands and masses overlying the right upper eyelid and temporal region. On microscopic study of the tumor after its removal it was found that there was a central strand, evidently a nerve, which on entering the growth became either fibrous or changed into a soft mass of fat. Its structure could not be clearly made out.

1869. Billroth. "Plexiformes Neurofibrom des oberen Augenlides und der Schläfengegend," *Archiv f. klin. Chir.*, 1869, vol. xi, p. 232.

A boy, aged eighteen years, strong and healthy, of moderate mental development, had had since birth a tumor of small size over the temporal region. It had suddenly taken on a rapid growth unaccompanied by any symptoms of discomfort. It had become as large as a fist, and involved the temporal region and upper eyelid. It was soft and flabby, and extended deep into the orbit. A defect

FIG. 12



Bruns' Case I, "Ranken-neurom."

was found in the parietal bone about the size of a pea. The tumor, which was removed, was seen to consist of a mass of plexiform, grayish-red, smooth, round cords. During the following thirteen months there was no recurrence (Fig. 11).

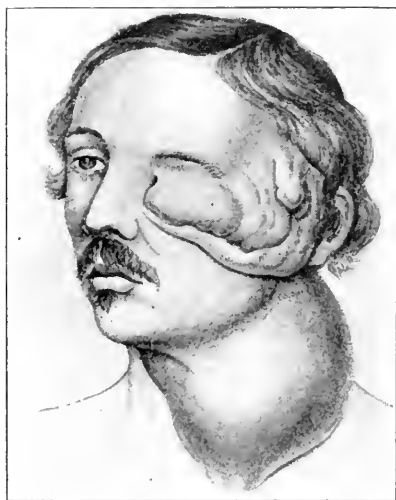
1870. Bruns. "Das Ranken-Neurom," *Virchow's Archiv*, 1870, vol. l, p. 80.

Case I, a man, aged twenty-eight years, had had since birth a painless tumor in the right temporal region. There was no history of a similar affliction in the patient's family. There were no intellectual disturbances; his general health was good. The tumor was situated just above the right ear, which was so pushed down that the pinna stood out horizontally (Fig. 12). The tumor possessed

a wormy feel, and was of rather soft consistency. It was removed, the patient dying from infection some days later. Microscopic examination showed new formation of nerve fibers by metaplasia of connective tissue.

Case II, a patient, aged thirty-three years, whose brother, Case III, had a similar tumor. The mother had numerous cutaneous wart-like excrescences over her body. Since birth the patient had had a flat tumor involving the left temporal region and left upper eyelid. At the time of puberty the growth developed and the eye had been lost owing to a suppurative infection. There were several painful spots over the tumor. On palpation numerous coils of a firmer consistency could be made out in the soft stroma of the growth.

FIG. 13



Brans' case II, "Ranken-neurom."

As seen in the illustration (Fig. 13) there was also a large cervical tumor which was removed at operation. The patient died on the tenth day from hemorrhage due to ulceration of the carotid artery.

Case III, a man, aged forty-three years, a brother of Case II. This tumor likewise was congenital and resembled very closely the one described above (Fig. 14). The eyeball in this case also had been lost at the time of puberty. There were no local areas of tenderness. The tumor was soft and movable, and on deep palpation numerous so-called cords could be found running through it.

1870. Laroyenne. Christot, *Gaz. hebdom.*, 1870. Ref. Cartaz, *Archiv. gén. de Méd.*

A child, aged five years, healthy in appearance, presented a painless tumor over the right cheek, which had enlarged rapidly shortly

before he came under observation. The tumor was soft and had numerous small palpable thickenings scattered through it. An incomplete operation was followed by immediate recurrence. The

FIG. 14



Bruns' Case III, Ranken-neurom. Brother of Case II. Fig. 13.

microscopic characters were those of a plexiform neuroma, showing at many points sarcomatous degeneration.

1870. Rizzoli. *Lo Sperimentale*, November, 1870. Ref. Bruns, *Beiträge zur klin. Chir.*, 1891, vol. viii, p. 1.

FIG. 15



Billroth's case of bilateral involvement of frontotemporal region.

Two cases are reported by Rizzoli, one of them a child, aged six years, in whom a tumor growing from the upper eyelid and skin over the orbital arch had been present since early life. In the other

patient, a man, aged twenty years, there had been present since early life a ranken-neurom which had developed in the temporal region and upper eyelid.

1870. Billroth. *Chir. Klinik*, Wien, 1869-1870, 54.

A man, aged thirty-three years, had had since early life a small swelling over the left eyebrow. Later on a similar swelling appeared over the right eyebrow. These tumors had slowly increased in size, forming sac-like folds which hung down over the eyes and cheeks (Fig. 15). After twenty operations the greater part of these tumor masses was removed. The patient had also a few superficial pea-size tumors over his chest.

1873. Fritsche. "Two Unusual Cases of Elephantiasis Arabum," *Clin. Soc. Trans.*, London, 1873, vol. vi, p. 160.

A patient, a beggar, aged twenty-six years, had an elephantiac transformation of the right half of his face; "the whole side of his face resembled an empty hanging bag." The tumor had been present since childhood. The opening of the right eye was on a level with the nostril. The eyeball was atrophied and hung by a long pedicle, the optic nerve being very near the opening of the eyelids. The helix of the right ear was enlarged and hung loosely down. The patient was said to be otherwise normal.

1875. Stokes. "Pachydermatocoele or Fibromolluscum," *Dublin Journal of Med. Sci.*, 1875, vol. lix, p. 69.

A man, aged thirty-two years, had had a slowly growing tumor situated in the temporal region. It had appeared early in life and had grown slowly. His general health was good. The tumor was very movable; its surface was irregular and nodular. It was not discolored, but was thickly covered with hair. An operation was successfully performed, though there is a note of great difficulty from a tremendous hemorrhage.

1876. Billroth. "Geschwülste," *Chir. Klinik*, Wien, 1872-1876.

A girl, aged fifteen years. There had been noticed since childhood a fulness of the right temporal region. In this situation a tumor developed which involved the temporal region and upper eyelid and upper part of the cheek. In the tumor mass numerous hard, irregular cords could be palpated. The tumor was tender. In two operations it was completely removed and there was no recurrence.

1876. Cartaz. "Etude sur le Neurome Plexiforme," *Archiv. gén. de Méd.*, 1876, vol. cxxxviii, p. 176.

A boy, aged eleven years, with a negative family history, had had since birth a tumor, the size of a dollar, elevated about 1 cm. above the scalp. It was situated over the left ear. It had developed slowly until within a few months, when it had doubled in size. It was painless. It hung down over the neck, and in the soft mass could be palpated cords and chains of harder tissue. The operation for its removal, though successful, proved a very bloody one.

1877. R. Marchand. "Das Plexiforme-Neurom (Cylindrische

Fibrom der Nervenscheiden)," *Virchow's Archiv*, 1877, vol. lxx, p. 36.

A boy, aged twelve years, in whom a tumor was first noticed when six months old. The growth was very slow. There was no history of a similar condition in the family. The upper lid of the left eye and adjacent part of the temporal region were involved. The upper lid hung down like a sac over the left eye, but on raising the tumor mass the eye was found to be normal in all respects. On deep palpation numerous dense cords could be made out. Deep pressure elicited some pain. The patient was successfully operated upon and the tumor is said not to have recurred.

Marchand reports the case of a boy aged eighteen years. There had been present since his fourth year a large tumor situated just

FIG. 16



Schüller's case, involving the territory of the superior maxillary as well as the frontotemporal region.

above his right ear. It had slowly enlarged, and at the time of operation consisted of a soft, doughy, painful swelling over the right temporal and occipital regions. In the depths were felt numerous strands of firm tissue on which small enlargements were palpable. The tumor was partially removed by operation.

1878. Schüller. *Deutsche Zeitschrift f. Chir.*, vol. ix, p. 261.

A woman, aged eighteen years, presented a tumor involving the left side of the face. It had developed slowly until puberty, after which time its growth was more rapid. The mass presented the usual characteristics of position and consistency (Fig. 16). It was removed, with a fair cosmetic result. The eyeball had been destroyed by suppuration some time before the operation.

Schüller reports a second case in a woman aged twenty-four years. A tumor on the right side of the face had been present since infancy, enlarging slowly until the time of puberty, when it had rapidly increased in size. In the deeper portions of the tumor several cords and knots could be palpated. It was successfully removed at operation.

1880. Schaltze. "Ein Fall von sehr grosser Fibroma Molluscum an Kopf und Gesicht," *Deutsche Zeitschr. f. Chir.*, 1880, vol. xiii, p. 374.

A young man, aged twenty years, had a tumor the size of his head hanging from the temporal region and cheek. It measured 31 x 22 x 12 cm. in its several diameters. There was no family history of a similar condition. The growth was first noticed when

FIG. 17



Schultz's case, designated a large "fibroma molluscum."

the patient was four years of age. It was then about the size of a pea. Within a year it grew considerably and was removed. It returned almost immediately and rapidly enlarged to its present size (Fig. 17). A radical operation was done in three stages, with a fair cosmetic result.

This case was studied histologically by von Recklinghausen, who was unable to demonstrate any nerve fibers in the tissue, but he considered this to be due to the enormous size of the growth, which was made up of fibrous tissue at the expense presumably of a few nerve fibers which were not demonstrable. He nevertheless regarded the case as one of "elephantiasis mollis."

1882. Labbé, (Case IV of Bruns' series.) *Beiträge zur klin. Chir.*, 1891, vol. viii, p. 1.

A woman, aged twenty years, had a tumor involving the forehead and upper eyelid, which had been present since she was a year old. The growth hung loosely down in a large fold.

1880. Schuster. (Case XVI of Bruns' series (*loc. cit.*). A boy, aged fourteen years, had an elephantiac enlargement which had been present since his fourth year. It involved the nose and cheek. The body was covered with numerous areas of pigmentation and fibroma molluscum.

1882. Socin. "Angeborene Elephantiasis der Rechten Gesichtshälfte," *Jahresbericht der Chir.*, Abth. d. Spitals zu Berne, 1882, p. 29.

A woman, aged twenty-seven years, who had always been healthy presented a tumor which had been slowly growing and which covered the right half of the forehead and temporal region, surrounding the orbit like a crescent, and hanging over the region of the upper jaw. It was pigmented, and within the mass could be felt the usual knotted cords. The upper lid was greatly enlarged and hung down over the eye in a large fold. In spite of serious hemorrhage the tumor was successfully removed in two stages.

1883. Volkmann. "Beiträge zur Kenntniss vom Plexiform-Neurom," Dissertation, Magdeburg, 1883.

A boy, aged ten years, had a congenital tumor hanging from the scalp, which reached as low down as the clavicle. The skin over the tumor was pigmented, hypertrophic, and was thickly covered with hair.

1890. Rapok. "Beiträge z. Statistik der Geschwülste," *Deutsche Zeitschr. f. Chir.*, vol. I. S. 538.

A girl, aged seventeen years, showed a tumor which developed in her upper eyelid during childhood. For a year and a half before she came under observation the growth had been much more rapid. Her father also had "neurofibroma plexiforma."

1891. Andry and La Croix. *Lyon Médical*, 1891, tome lxvii. No. 21, p. 109; No. 22, p. 145.

A boy, aged eight years, giving no history of a similar condition in the family, had a tumor which was first noticed when he was two years of age. He was of normal mentality. The growth had been gradual and at the age of eight the tumor, involving the left temporal region and the left upper eyelid, had reached a large size. It presented the usual characteristics. It was successfully removed at operation.

1891. Bruns. "Ueber das Rankenneurom," *Beiträge zur klin. Chir.*, vol. viii, p. 1.

Case VII of his series. A female, aged twenty years, had a tumor of congenital origin, involving the upper eyelid and orbit. The upper lid was greatly enlarged and elephantiac. There was also a defect in the roof of the orbit.

Case XI of his series. A patient of Dessauer's. A man, aged

forty-two years, had a tumor of the temporofrontal region and involving the upper eyelid. There was also a large growth of similar character hanging from the loin. The tumors consisted of several soft flabby folds of skin. Besides these tumors he had numerous naevi and fibroma molluscum.

Case XIV of his series. A man, aged thirty-eight years, had a congenital tumor involving the frontal region and upper eyelid. Hanging from the forehead, the tumor was draped down over the eye in several soft, flabby folds. There were numerous fibromata molluscum scattered over the body.

FIG. 18



FIG. 19



Magalhaes and Manson's case of "congenital elephantiasis."

1893. Magalhaes and Manson. "A Case of Congenital Elephantiasis of the Scalp," *AMER. JOUR. MED. SCI.*, 1893, vol. cv, p. 120.

A man, aged thirty-two years, since childhood had a growth which originated from the right side of the scalp and had slowly and progressively increased in size. The "hood-like" mass was soft and flabby. The right half of the cranium corresponding to the tumor was markedly deformed (Figs. 18 and 19).

1896. Dennis. We are indebted to Dr. Frederic S. Dennis for this photograph (Fig. 20) of a patient whose tumor and other skin lesions are depicted in a more advanced state in vol. iv. of his *System of Surgery*. The condition is associated with the other

manifestations of von Recklinghausen's disease, and the growth was of long standing.

FIG. 20



Dennis' case.

FIG. 21



Lanz's case of "fibroma molluscum."

1904. Lanz. *Handbuch d. Chir.* Bergmann, Bruns, and Mikulicz, second edition, vol. i, p. 31.

A man, aged twenty years, had a large growth (Fig. 21) which

made him look as though he was wearing a pendulous cap. The mobility of the mass was very marked. He had fibroma molluscum and areas of pigmentation scattered over his entire body. The tumor was successfully removed.

1905. Wynn. "Plexiform Neurofibroma," *Jour. Amer. Med. Assoc.*, 1905, vol. xlv, p. 500.

A young man, aged nineteen years, giving no history of similar affliction in the family, had an elephantiac tumor of the forehead, which was removed when he was eleven, but which gradually returned. Beginning about the fourth year, there developed a dense, diffuse enlargement over the parietotemporal region, and somewhat later in the orbits and cheek. The skin hung in folds from the orbits down over the lower jaw. Irregular, worm-like masses could be palpated deep in the tumor. Microscopically, no nerve fibers were demonstrated.

ORIGINAL ARTICLES.

GRAPHIC METHODS IN THE STUDY OF CARDIAC DISEASES.¹

BY ARTHUR D. HIRSCHFELDER, M.D.,

INSTRUCTOR IN MEDICINE, JOHNS HOPKINS UNIVERSITY BALTIMORE.

(From the Medical Service of the Johns Hopkins Hospital.)

THE first observations upon pulsation of the veins was reported to the French Academy by Homberg in 1704,¹ in a case of heart failure; Zuliani, in 1805, and Benson, in 1836, noted similar pulsation in cases in which autopsy showed tricuspid insufficiency; and Kreysig, in 1814, observed the pulsating liver in such cases. The experimental study of the pulsation in the veins was first undertaken by Barry in England, in 1826, and by Wedemeyer in Germany, in 1828;² but although Weyrich, in 1853,³ and Bamberger⁴ and Friedreich,⁵ a decade later, made further contributions to this subject, little practical importance was attached to it. The scientific investigation of pulsations and pressure changes in the circulatory system really dates from the publication of Marey's *Physiologie médicale de la circulation du sang* in 1863, and the careful and complete experimental and clinical studies emanating from his laboratory have furnished the basis for most of the work done before 1895. Since then the work of Engelmann⁶ on the myogenic origin of the heart-beat, and its clinical application by Hering⁷ and Wenckebach,⁸ have given a new stimulus to the study of the diseased

¹ Read before the Johns Hopkins Medical Society, Baltimore, February 19, 1906.

heart from the standpoint of its rhythmicity, irritability, force of contraction, and conductivity.

While this work was being done in the laboratories of Holland and Germany, an English practitioner, James Mackenzie, of Burnley, was working out its clinical application. He made many routine tracings simultaneously from the radial and the carotid arteries, the jugular vein, and over the heart, to discover the sequence and strength of the contractions of the auricles and of each ventricle as well, and to locate the site of the disturbance in function. Mackenzie amassed a tremendous amount of important information; and the appearance of his book upon the *Pulse*, in 1903,⁹ may almost be said to mark a new era in the study of cardiac disease.

The observations which I shall present to illustrate the various phases of disturbed heart action were begun in the service of Prof. J. O. Hirschfelder, in San Francisco, in conjunction with Dr. Emil Schmoll, and have been continued in the medical clinic here during the past three months. Owing to improvements in technique and apparatus, all the tracings to be presented this evening, except that in Fig. 15, were made here, although similar results had been obtained in San Francisco.

The apparatus used in San Francisco was simply a Harvard revolving drum, with two Marey recording tambours. This is quite satisfactory, but very bulky. Mackenzie and the German observers use a modified Jacquet sphygmograph, upon which a Marey tambour and recording lever is mounted, so as to give at the same time a tracing from the radial and one from the carotid, jugular, or apex. This apparatus, known as the Jacquet cardio-sphygmograph, is small and portable, but like all radial sphygmographs it is more or less difficult of application, and a great deal of valuable time may be lost in adjusting it.

In the medical clinic here we have been using a modification of the Erlanger blood pressure apparatus,^{10*} which has been very satisfactory and which has the advantage of revealing the blood pressure and giving the brachial pulse tracing; it also affords a method of differentiating between certain forms of pulse irregularities that cannot be differentiated by other methods. With this apparatus

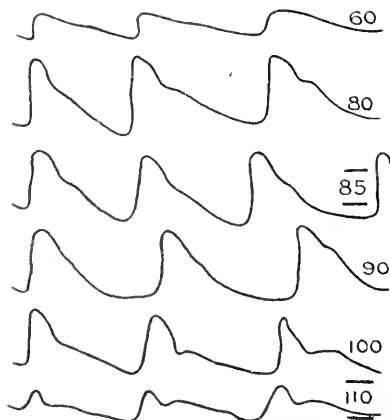
*The clockwork moving the drum of the Erlanger apparatus has been modified so as to give a fast rate of rotation as well as a slow one—and an upright steel rod fixed in the base of the apparatus so as to carry two Harvard sphygmograph tambours to write upon the drum. The exact application is secured by screw adjustments. The recording levers are made of magnesium (flash-light) ribbon; the writing points are of celluloid film, and are very convenient. From the tubes of these recording tambours rubber tubes lead off to the receiving funnels. The most convenient form for the latter is, for taking the jugular pulse, an ordinary stethoscope bell—the open arm of the Y-tube being closed with the finger after the bell has been satisfactorily applied over the vein.

For carotid pulse or apex-beat the soft rubber tip used upon stethoscope bells may be employed. The small end of this is plugged with a perforated rubber stopper, through which a T-tube is inserted, and this is applied as above.

For liver or respiration tracings a medium-sized glass funnel may be used.

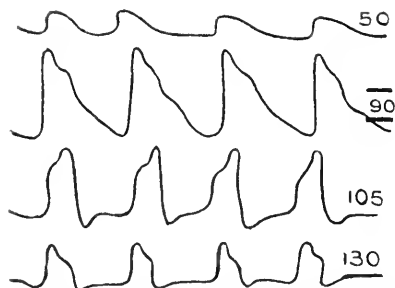
the pulse in the brachial artery is taken, and may be taken at any desired pressure. This is of great importance, as different pressures upon the artery greatly modify the pulse form. This can best be illustrated by a series of brachial tracings from the same artery at different pressures (Figs. 1 and 2), which show why so many good observers can obtain almost any form of pulse with the radial

FIG. 1



Brachial pulse tracings taken from the cuff on the upper arm of a normal individual, with pressure of air in the cuff at 60, 80, 85 mm. (diastolic pressure), 90, 100, and 110 mm. Hg (systolic pressure) respectively, showing the change in pulse form due to pressure on the artery.

FIG. 2



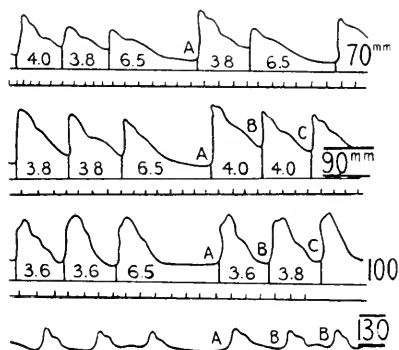
Brachial pulse tracings from another individual with a mild grade of arteriosclerosis, taken at 50 and 90 (diastolic pressure) and 105 and 130 mm. Hg (systolic pressure) respectively, showing an anacrotic wave on the tracings taken at pressure of 105 mm. Hg, not at other pressures. This may explain some false tracings of *pulsus tardus* obtained with radial sphygmographs.

sphygmographs, when there is no fine regulation of pressure on the artery. Fig. 3 shows that what may appear to be an irregularity in force, when taken below the diastolic pressure, may really be only an irregularity in rhythm, with a fall in pressure, during the long diastoles, for in the tracings taken at pressures above the minimal the apparently weak beats, *B* and *C*, are seen to be as strong as *A*. This is contrasted sharply with the true irregularity

in force and rhythm occurring in the same patient at another time (Fig. 4).*

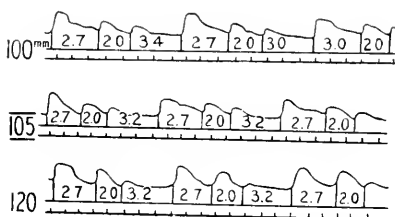
The brachial pulse tracing is very easily obtained, and affords a very convenient standard of time upon which to compare the events

FIG. 3



Brachial pulse tracings from a patient with an irregular pulse. Tracings taken at 70 and 90 mm. Hg (diastolic pressure) show one large beat, *A*, followed by two small ones, *B* and *C*. 90 mm. represent the diastolic pressure after the long pause at *A*. Tracings at 100 mm. Hg, (diastolic pressure in the shorter pauses, *B* and *C*) and tracings at pressures above this show that these latter beats are of force equal to beat, *A*. Hence irregularity in rhythm only.

FIG. 4



Brachial pulse tracings from same patient as in Fig. 3, taken at another time at pressures of 100, 105 (diastolic pressure), and 120 mm. Hg. Irregularity here persists at higher pressures. Inequality in force and rhythm is shown.

in different tracings with one another, by measuring off the time of their occurrence before or after the upstroke in the brachial.† The carotid pulse is taken by applying the receiving tambour

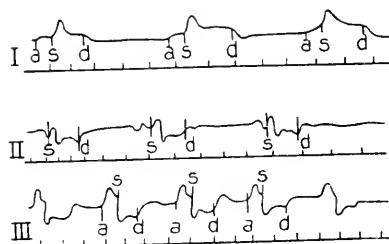
* The same result might be obtained by determining the presence of weaker systoles by the method of Hensen with the Riva-Rocci apparatus (and broad cuff). Raise the pressure in the cuff on one arm, count the pulse rate simultaneously in both—and determine the pressures at which the individual beats appear. If the systolic pressures are equal, and there is irregularity in size in the sphygmogram this is due to irregularity in diastolic pressure.

† The best method for measuring out time relations upon two simultaneously recorded curves is not by exactly superposing the levers, and then dropping a perpendicular from one to the other, but by measuring horizontally the distance of the desired point from the starting point of the curve, and then marking off on the other curve the same distance from the starting point. Small but very important inaccuracies in measurement, as well as much trouble in the adjustment of levers, is thereby obviated.

or funnel, with firm pressure, above and in front of the sternocleidomastoid; for the jugular pulsation, it is applied lightly over the base of the relaxed sternocleidomastoid or over the external jugular vein in the supraclavicular fossa where the vein can be seen to pulsate. The apex tracing should be taken with the receiver as far to the left as possible, for otherwise the curve from the right ventricle is obtained with systolic retraction instead of systolic impulse as shown in Fig. 5.

Type I shows the apex tracing; II is the tracing over the right ventricle with a systolic retraction *s-d*, instead of a systolic impulse; III shows the mixed type, impulse due to the auricle *a-s*, with retraction due to the ventricular systole *s-d*. The systolic retrac-

FIG. 5



Three types of apex tracings: (I) normal apex tracing taken over the left ventricle, showing systolic impulse; (II) from the same person taken over the right ventricle at a point 2 cm. medial to (I), showing systolic retraction; and (III) from another patient, showing presystolic impulse *a-s* due to auricular contraction, and systolic retraction *s-d* (the apex beat being due mainly to the right ventricle). For lettering, see Fig. 6.

tion at the apex, so frequently seen in large hearts, is due to the fact that this area is occupied by the right ventricle.

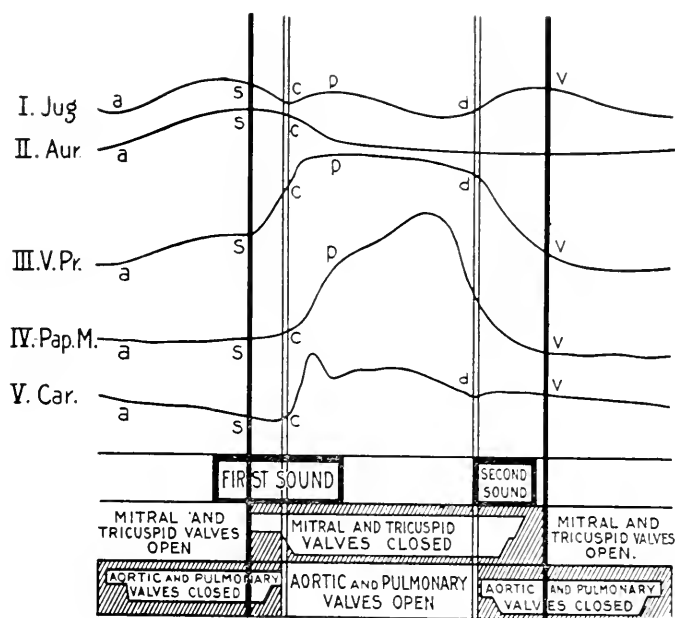
The sequence of events in the heart and great veins is shown in the diagram (Fig. 6), which is a diagrammatic but fairly accurate compilation of the experimental results of Marey,¹¹ Roy and Adami,¹² Huethe,¹³ Porter,¹⁴ and Einthoven and Gehuk.¹² It corresponds with experimental data somewhat more closely than does the diagram of von Frey, which is so frequently figured in the text-books, among others by Mackenzie (*loc. cit.*)*.

The curve in Fig. 6 shows a wave *a-s* lasting normally one-sixth of a second, due to auricular systole. This is present upon the

* The time of occurrence of the first sound is still in dispute. The curves of Einthoven and Gehuk with the capillary electrometer do not show definitely any sound wave occurring before ventricular systole. On the other hand, those of Huethe (*Ueber mechanische Registrierung der Herztonen*, Archiv f. d. gesammte Physiologie, 1895, Band 1x, S. 263), made with a different recording apparatus, show a definite presystolic sound wave in some but not in all of the cases examined. Moreover, in many cases of heart-block a feeble sound corresponding to the systole of the auricles can be heard over the heart; so that it is probable that in many, though perhaps not in all cases, the first sound begins before ventricular systole, and is produced by vibrations from (1) the contracting auricles, (2) the vibrating valves, and (3) the contracting ventricular muscle.

jugular tracing and also upon most good apex tracings (when taken with the receiver described—but not when the Marey cardiograph tambour is used), and the duration *a-s* marks the period of conduction from auricle to ventricle. Then there is the short almost negligible period *s-c* (0.03 to 0.07 second) before the opening of the aortic valves; then a wave *c-p* on the venous tracing just following the rise of pressure in the ventricle, when after closing the mitral and tricuspid valves at *s* the rise of pressure in the ventricles forces these valves back upward into the auricles and causes stasis in the veins. Then comes the fall *p-d* lasting through almost the entire duration

FIG. 6



Semidiagrammatic representation of the events in the cardiac cycle: *Jug.*, pulse in the jugular vein; *Aur.*, contraction of the auricle; *V. Pr.*, intraventricular pressure; *Pap. M.*, contraction of the papillary muscles; *Car.*, carotid pulse. Below are given the times of occurrence of the heart sounds and of the opening and the closing of the heart valves.

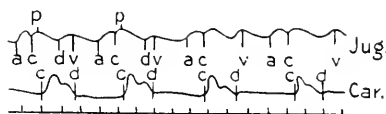
of the ventricular systole, while the papillary muscles are drawing these valves down again into the ventricle (as shown in Curve 4); this action is further supplemented by the tug upon the great veins directly. At *d*, the instant of the dirotic notch in the aorta, and practically also in the carotid, systole ceases; and the aortic valves close.

It may be noted in this connection that the duration of the ventricular systole is most accurately measured upon the carotid tracing, for the curve obtained over the apex is rarely definite enough to be relied on. The period of systolic outflow can always be measured,

The nervous mechanism involved can, therefore, be ascertained only at the immediate onset of a tachycardia, not after it has persisted. Neither extreme prolongation of diastole, nor extreme over-distention of the ventricles, such as is seen in partial or complete heart-block, has any effect whatever upon the duration of ventricular systole (Fig. 8), so that Huethle's statement (*loc. cit.*) that the duration of systole depends upon the amount of blood in the ventricles is not absolutely true.

To return to the diagram (Fig. 6), the next event shown upon Curve I of the jugular pulse is a very important one for the interpretation of pulse tracings: a rise *d-v* beginning a little before the closing of the aortic valves at *d* and lasting exactly to the opening of the tricuspid valves at *v*. It is due to the fact that the papillary

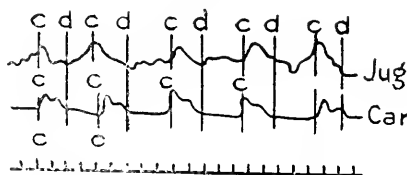
FIG. 9



Normal or physiological venous pulse from the jugular vein, *Jug.*, and pulse from the carotid artery, *Car.* Lettering as in Fig. 6.

muscles and the heart as a whole have ceased to pump blood out of the veins into the auricles, and the blood accumulates until it is let out into the ventricles by the opening of the tricuspid valves. After this fall there are no further waves upon the jugular tracing until the next auricular wave. If any other wave appears it is abnormal, and is to be interpreted by referring it to the various events that appear normally.

FIG. 10



Normal or physiological venous pulse from the jugular vein, *Jug.*, and pulse from the carotid artery, *Car.* Type considered normal by Sahli. Lettering as in Fig. 6.

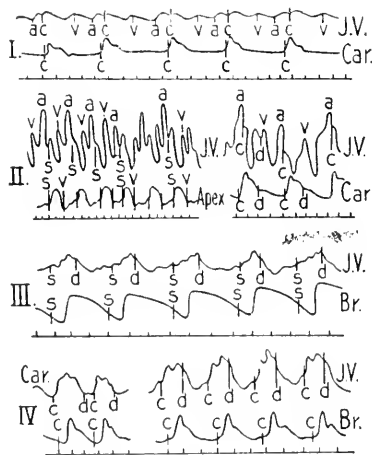
Fig. 9 shows the normal jugular tracing in which can be seen all the events shown in the diagram for the jugular vein—the auricular wave *a-c*; the rise followed by the collapse during ventricular systole *c-p-d*; the stagnation wave terminating with the opening of the tricuspid valve *v*. The presystolic filling due to auricular systole *a-c* is shown on almost all normal individuals if the veins are full enough to give any pulsation at all. Sahli and Riegel give

as normal a second type in which the auricular wave *a-c* is absent; this is shown in Fig. 10, but the first type is much more frequent.*

Moreover, there are very many cases in which no tracing at all can be obtained from the veins. These may be divided into two classes: (1) Those in which the veins are not full enough to give visible pulsation, and (2) cases of phlebosclerosis in which the walls of the vessels are too rigid to respond to the small changes of pressure, or in which the valves of the veins damp the pulsation completely.

We shall now consider the pathological forms of venous pulse: First, the transition from normal to tricuspid insufficiency, Fig. 11.

FIG. 11



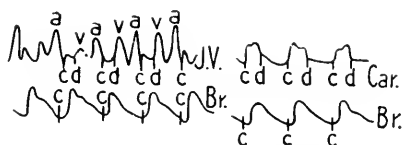
Transition from the normal jugular venous pulse, *J. V.*: (I) to the venous pulse of tricuspid insufficiency (IV); (II) veins full and all waves accentuated, but no abnormal waves present; (III) gradual filling of veins during systole, with diastolic collapse, from same case as IV, but two weeks earlier; *s-d* ventricular systole; *Br.*, brachial pulse at diastolic pressure.

Curve I shows a normal venous tracing. Curve II is at first glance of entirely different form, but on analysis is seen to be exactly the same only with accentuation of each wave, on account of the overfilling of the veins. In curve III the auricular presystolic wave does not appear at all, and during systole there is a gradual systolic filling instead of systolic collapse. This is due to the fact that the auricle is already overfilled, no more blood can be pumped into it and out of the veins, hence they continue to fill gradually until the tricuspid valves open and the diastolic collapse takes place, as noted

* Jugular tracings of this type seen with weak hearts are sometimes mistaken for manifestations of tricuspid insufficiency, but the presence of the *systolic full p-d* instead of the systolic plateau (Fig. 2, Curve 4) allows them to be distinguished. The absence of the auricular wave *a-c* may be due to a weak right auricle or to conditions within the heart (abnormal relaxation of ventricles in diastole, etc.) facilitating the flow from auricle to ventricle; or, on the other hand, the pulse may be simply communicated from the carotid artery.

by Gerhardt.¹⁸ Curve IV represents the same case at a later stage when tricuspid insufficiency is already definite; the curve in the veins (the so-called ventricular type of venous pulse) exactly records the intraventricular pressure with sudden systolic filling and diastolic emptying. On these tracings the auricular presystolic wave does not appear, probably because the auricle is contracting too feebly, although still strongly enough to stimulate the auriculoventricular bundle, and thereby the ventricle. Experimentally one often sees these very feebly contracting overdistended auricles in failing hearts of dogs. Sometimes there is even complete paralysis, first mentioned by v. Frey and Krehl,¹⁹ but in such cases the auricle may resume action after a period of rest. James Mackenzie²⁰ and Wenckebach²¹ think that in all such cases the ventricle contracts before the auricle, basing their opinion upon the experimental work of Lohman²² done in another connection. However, there is no evidence at all conclusive that such is the case in man, and in failing hearts of animals this reversal of rhythm is never seen. On the contrary, the period of auriculoventricular conduction is lengthened rather than shortened as the heart weakens. The venous pulse, then, gives

FIG. 12



From a patient with aortic insufficiency, oedema, dyspnoea of cardiac origin, and enlarged (non-pulsating) liver. Nevertheless, a normal tracing from the jugular vein (*J. V.*), showing all the physiological waves and absence of tricuspid insufficiency.

the most definite diagnostic sign of tricuspid insufficiency, for with every tricuspid insufficiency we have marked systolic filling of the veins instead of systolic collapse, and only one venous pulsation with each carotid beat instead of two as normally. The two pulsations seen normally are the systolic fall (*p-d*) and the fall after the stagnation wave *v*. That cardiac oedema and dyspnoea with distention of the peripheral veins may persist for days without any insufficiency of the tricuspid valve is shown by the tracing (Fig. 12) taken from a case of aortic insufficiency in which these signs and symptoms were present, but in which there was no back-flow into the veins during ventricular systole. Mackenzie²⁰ has also given a tracing from such a case.

Another tracing which affords evidence of tricuspid insufficiency is the tracing from the liver. Normally, as the liver rests upon the diaphragm just beneath the right ventricle, it is pushed down as the ventricle fills in diastole, and pushed up by the abdominal organs when the ventricle draws up in systole,—in other words, there is systolic retraction of the liver. But when there is tricuspid insuffi-

ciency the blood is forced back into the liver during systole, and a systolic impulse is given instead, a fact noted by Kreysig in 1814 (*loc. cit.*) and by Mahot in 1869.²² Fig. 13 shows the two types mentioned.

We may next consider briefly the irregularities of the heart, which may be divided into several groups.

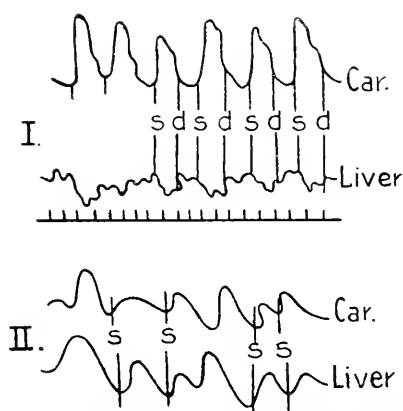
1. Those arising from intermittent action of the spinal and medullary centres especially through the vagus.

2. Irregularities arising at the mouth of the vena cava and in the auricle, due to disturbed contractility or overdistention of the auricle, with auricular extrasystoles.

3. Irregularities due to premature contractions of the ventricle, arising in the ventricle from similar causes.

4. Irregularities due to failure of the auriculoventricular bundle to conduct, so that the ventricle does not respond to all the auricular beats, the so-called partial or complete heart-block.

FIG. 13

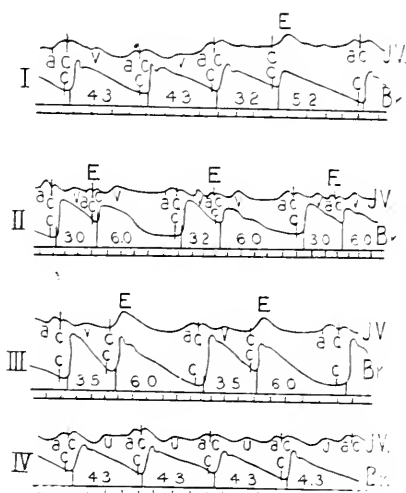


Two types of pulsation over the liver: (I), normal with systolic retraction of the liver *s-d*; (II) from case of tricuspid insufficiency, systolic protrusion of liver.

5. There may be, as now claimed by Mackenzie and Wenkebach (*loc. cit.*) and some others, a fifth form of extreme tachycardia due to spontaneous initiation of the cardiac rhythm by the rhythmic contraction of the auriculoventricular bundle of His, auricles and ventricles taking up the rhythm and contracting simultaneously. It may be said, however, that the experimental and clinical evidence for this theory may be explained in other ways. In stimulating the auriculoventricular bundle electrically the simultaneous contractions of auricles and ventricles obtained by Lohmann may have been due to escape of electrical stimulus to these parts directly (as suggested by Dr. Erlanger). On the other hand the absence of an auricular wave on venous tracings may be due to weakly contracting auricles.

Clinically, it is not especially difficult to differentiate between irregularities arising in the ventricle and those arising in the auricle. Cushny and Matthews²³ have shown that if the ventricle is stimulated by an induction shock an early contraction follows the stimulation; the ventricle then fails to respond to the next regular stimulus coming down from the auricle, so that this impulse is skipped and the regular rhythm is resumed when the ventricle responds to the second regular impulse (Fig. 14, Curve II), that interval, occupied by the regular systole and the premature systole until the next regular systole, is exactly twice the interval between two beats, as shown on the tracing (Fig. 14, Curve IV). Further, it can be seen

FIG. 14



Irregularities of the heart: (I) showing a ventricular extrasystole *E*; (II) auricular extrasystoles at *E, E, E*; (*J. V.*), jugular pulse. *Br.*, brachial time in $\frac{1}{2}$ second; (III) continuous bigeminal pulse due to ventricular extrasystoles; (IV) same one hour after atropine, 1 mg. grain, showing regular pulse and change in the venous pulse.

that the extrasystole is not preceded by an auricular wave as are other systoles, but the auricle when it contracts at all does so after the ventricle and during the period of ventricular contraction, giving rise to the large wave (Fig. 14, Curve I, *E*). These two points—absence of the auricular wave on the venous tracing, and duration of the regular systole plus extrasystole always equal to twice the interval between two regular beats, characterizes the extrasystole of ventricular origin.

Cushny and Matthews (*loc. cit.*) further showed that when the auricle was stimulated by a single induction shock, the regular con-

* Clinically, the ventricular origin of the extrasystole may sometimes be noted from the fact that although corresponding to each regular systole there are two pulsations seen in the jugular vein, corresponding to the ventricular extrasystole there is but one (see Fig. 14), whereas with the auricular extrasystole both waves are still seen.

traction and the extra contraction following occupy less than twice the regular period (This shortening of the compensatory pause to less than the interval between two regular beats does not invariably occur, but when present is characteristic of auricular extrasystoles). Here, of course, the venous pulse still shows the auricular wave (Fig. 14, Curve II, *E, E, E*) for extrasystole as well as for regular systole. These two points characterize the extrasystole of auricular origin. Of course, just as one extra stimulus is sent prematurely, several extra impulses in succession may reach either auricle or ventricle. When this occurs a series of extrasystoles are seen, and two, three, or four, etc., times the regular interval between pulse-beats elapses from the beginning of the last regular beat before the extrasystoles to the beginning of the first regular beat following them.

In the case of all extrasystoles, the earlier the occurrence the shorter and weaker the contraction, for the heart has then not fully recovered from the preceding contraction. If the systole occur too early it may be so weak that the intraventricular pressure never reaches the minimal pressure in the aorta, the aortic valves are not opened, and a beat is felt at the apex which does not reach the arteries at all, the so-called "frustrane contractionen" of Hochhaus and Quincke.²⁴ The heart recovers more quickly after an incomplete systole than after a large contraction.

To return to the type irregularities: besides the irregularity from extrasystoles arising in the auricles and in the ventricles, there is the purely neurogenic type of irregularity, in which the regular rhythm is interrupted by a long pause, usually less than twice the pulse interval (Fig. 3). This is what Mackenzie calls the youthful type, because it is very common in otherwise healthy children and young adults. Reysch²⁵ has recently shown that this is due to occasional overaction of the vagus, because in these cases the pulse becomes absolutely regular after giving $1\frac{1}{20}$ to $\frac{1}{60}$ grain of atropine to paralyze vagus action. In these cases we sometimes have, as shown in Fig. 3, irregularity in rhythm without irregularity in force.

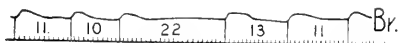
Long ago Delio²⁶ was able to show that atropine made some pulses regular and had no effect at all on others, and although his work was done before the Engelmann doctrine of extrasystoles, in the light of the newer work, this enables us to differentiate between the three forms of irregularity—the neurogenic which becomes regular under atropine by removing the irregular stimuli, the auricular irregularity due to disturbed contractility and rhythmicity of the auricle which will not become regular after atropine, and the ventricular extrasystole. In the latter case as shown by Delio, but first interpreted by H. E. Hering,²⁷ the rate of the auricles becomes accelerated after paralysis of the vagus, and when they are beating fast enough the stimuli from the auricles reach the ventricles before the extra stimuli, and the pulse becomes regular, each ventricular contraction being preceded by an auricular contraction

(Fig. 14, Curves III and IV). The atropine test combined with the venous pulse tracing allows us, therefore, to differentiate between the true cardiac neurosis and the myogenic disturbance of contraction.

The fourth type of irregularity is the type of heart-block, partial or complete, in which the ventricle either occasionally fails to respond to some of the impulses from the auricle or beats absolutely independently of it. The subject of complete block has been very completely discussed by Dr. Erlanger.²⁸

Cases of partial block are probably not infrequently seen after fevers, especially as shown by Mackenzie (*loc. cit.*) in the post-influenzal bradycardias, in which he has found the ventricle failing to respond to alternate auricular impulses.*

FIG. 15



Brachial pulse from case of severe pneumonia, showing an occasional omission of a beat. Time marked by vibrating spring at the rate of about 20 per second.

Mackenzie also states that in the fatal pneumonias there is a "dropped" beat with exactly twice the normal interval, which in his experience is always a herald of death. But in one case under my care, in San Francisco, recovery followed in spite of the dropped beat (Fig. 15). (No sounds could be heard over the heart during the long pause.) So far as I know there are no venous pulse records of such cases, but they are probably instances of partial heart-block. Stähelin²⁸ has observed what may be similar beats in convalescents from pneumonia after exercise, and it is not improbable that post-febrile syncope, and perhaps the sudden deaths after diphtheria, may be due to a Stokes-Adams syndrome from toxic heart-block.

* Such failure of the ventricle to respond to alternate beats of the auricle might be due to either of two causes:

1. There may be a slight organic lesion of the myocardium or endocardium in the vicinity of the auriculoventricular bundle just sufficing to produce this mild grade of heart-block. Erlanger and Hirschfelder²⁹ have shown that in experimental partial heart-block in dogs, brought about by slightly clamping the auriculoventricular bundle so that the ventricles respond to only alternate contractions of the auricles, stimulation of the vagus improves the conductivity and brings about response to each auricular contraction.

2 Bayliss and Harling,³¹ Reid Hunt, l. c., and others have produced a similar dropping of alternate beats by the ventricle upon careful stimulation of the vagus and in some cases upon increasing the tone of the vagus. Rühl (*Zeitschrift f. experimentelle Pathologie und Therapie*, Berlin, 1905. Band ii, S. 83) has shown that in some clinical cases where the ventricle responds to alternate beats of the auricle response to each beat occurs after atropine is given, and on the other hand that dropping of beats of the ventricle can be brought on in normal individuals by forcible pressure on the vagus in the neck.

Hence it seems possible to differentiate between these two groups of partial heart-block by the atropine test—the dropping of beats disappearing after atropine when the disturbance is functional; the dropped beats continuing after atropine when there is an organic lesion near the auriculoventricular bundle.

These are some of the questions for subsequent investigation, but enough has been done to establish the method of multiple tracings as a routine in the clinical study of heart diseases.

Unfortunately, the excellent series of papers of H. E. Hering, J. Rihl and O. Pan in the *Zeitschrift f. experimentelle Pathologie und Therapie*, 1905, Band i und ii, came to hand after this article had been prepared for the press; all who are interested in the subject will certainly consult them in the original.

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INSUFFICIENCY OF THE TRICUSPID VALVE IN THE COURSE OF PERNICIOUS ANEMIA.¹

By ROBERT B. PREBLE, M.D.,

PROFESSOR OF MEDICINE IN THE NORTHWESTERN UNIVERSITY MEDICAL SCHOOL, CHICAGO, ILLINOIS.

THE influence which anemia, of whatever type or cause, exercises over the nutrition and consequently the function of the heart muscle has been the source of frequent discussion. The effects which these changes have upon the size, shape, rhythm, and tone of the heart have been extensively considered. Particularly is this true of the so-called relative insufficiency of the mitral valve. It would be quite aside from the subject which I wish to present briefly to enter into any discussion of the mechanism of these insufficiencies. Whether they are due to dilatation of the auriculoventricular orifice or, as is more likely, to inco-ordinate action of the papillary muscles, has no bearing on the question of their existence. While the differentiation of this type of insufficiency from the accidental heart murmurs so common in anemia is difficult and often impossible, yet after making due and sufficient allowance for error, the cases of

¹ Read at a meeting of the Association of American Physicians, Washington, D. C., May 15 and 16, 1906.

leakage through the mitral valve in the course of anemia are not at all uncommon.

While the existence of this type of mitral insufficiency has been generally recognized for years there has, curiously enough, been little or no consideration of the possibility of the same thing happening in the right ventricle. This is the more striking because one might expect the thin walls of the right ventricle to yield more readily than those of the left, and while the diagnosis of the relative mitral insufficiency is surrounded by great difficulties and uncertainties, the tricuspid insufficiency can be diagnosed with certainty and usually with ease.

I am inclined to believe that the same thing is true of these relative insufficiencies as has been true of so many things, namely, that they are common enough, but are entirely overlooked until attention is forced to them by some particularly striking example, and the attention, once aroused, finds them common.

The first case, which I wish to report, was too striking to permit of its being overlooked. The subject was a lady of seventy-odd years, whom I saw with Dr. Hutchison, of Chicago. She had been gradually failing for some months, but as the loss of strength was slow and unaccompanied by pain or any striking symptom, nothing was done for a long time. Dr. Hutchison had been caring for her for some weeks, having made a diagnosis of primary pernicious anemia—a diagnosis in which I fully agreed. The thing which particularly struck me about the patient was the intensity and character of the pulsation in the external jugular veins. These veins were greatly distended, so much so that they could be easily taken between the fingers, and on timing the pulsation it was found to be systolic, corresponding exactly with the apex beat. The pulse in the jugulars was markedly stronger than the pulse in the carotids. The heart was found to be but slightly enlarged to the right, the absolute dulness being at the right border of the sternum; the second pulmonic tone was of approximately normal intensity. There was a systolic murmur, loudest at the apex. The liver was only slightly enlarged and did not pulsate. There was no edema of the legs, no dyspnea, and no cyanosis. She could sleep without having the head elevated.

An unfavorable prognosis was made, largely because it seemed likely that a pernicious anemia which had caused such alteration in the heart nutrition that a tricuspid insufficiency resulted, would probably end fatally in a short time. This did indeed happen, death taking place little more than a week later.

This was the first instance of this which I had seen, but curiously enough, six days later I saw another. The second patient, also a woman, was younger, fifty-three years. She had been seriously ill three years previously with an anemia which had been called pernicious. The woman at that time became so low that her life was

despaired of, but she finally improved sufficiently to resume her household duties and enjoy good health.

Three months before I saw her she began to fail, and not improving under the treatment which three years before was successful, I was asked to see her. When I saw her she was lying unconscious, having been in this condition for about three hours. She was profoundly anemic, lemon-yellow in color, and moderately emaciated. Like the first patient, she showed a very active positive venous pulse in the jugular veins. This pulsation could also be seen and felt in the small veins on the anterior surface of the chest and upper arm. The heart was only moderately dilated, with a pulse of 130. The second pulmonary sound was not reduced in intensity. The systolic murmur which could be easily heard was no louder over the auscultation point of the tricuspid than elsewhere. The liver was not enlarged and there was only slight cedema of the legs. The blood gave the usual picture of pernicious anemia, but as the patient died some three hours later only one examination could be made.

The third patient is an Irish carriage painter, of forty years, whom I saw in Dr. Slaymaker's service at the County Hospital in Chicago. This patient first entered the hospital in the fall of 1903 complaining of girdle sensation, numbness and tingling in the legs and arms, and ataxia, especially marked in the legs. He was in the hospital for some months, but left improved. He continued at his work at intervals and re-entered the hospital in March of this year. Examination shows a tall, slender, emaciated man, lemon-yellow in color. The apex of the heart is in the fourth interspace in the nipple line, the absolute dulness is at the right border of the sternum, to the upper border of the third rib, and to the apex-beat. The relative dulness reaches one and one-half inches to the right of the right border of the sternum. The second pulmonary tone is accentuated; there is a loud systolic murmur, loudest at the third left interspace. The external jugulars show a positive, systolic centrifugal pulsation. The liver is not enlarged, there is no cedema, cyanosis, or dyspnea. The blood shows the ordinary picture of pernicious anemia.

We have then three cases of pernicious anemia accompanied by a positive, systolic centrifugal pulse in the external jugular veins. Two of the cases ended promptly in death; the third patient is still alive and is improving somewhat.

There are several ways in which these cases differ from the ordinary form of relative tricuspid insufficiency. As seen so frequently, this lesion is due to dilatation of the right heart, because of the excessive work thrown upon it by a mitral lesion, usually a combined stenosis and insufficiency, or by a gradually progressive emphysema of the lungs or some other pulmonary process interfering with the passage of the blood from the right to the left heart. In addition to these one sees less often cardiac dilatation and consequent tricuspid leakage from acute or more often chronic

myocarditis, and still less often the same thing happens in the course of aortic lesions. In all of these instances the tricuspid insufficiency is accompanied by marked cyanosis, dyspnoea, passive congestion of the liver, oedema of the legs and often of the body cavities. All of these phenomena were conspicuously absent in the cases reported. In addition to these differences, stress should be laid on the fact that while all of the cases reported showed some enlargement of the heart, in no instance did it compare in degree with that seen in the commoner instances of this lesion.

Shortly after the first two cases were seen, I read an article by Leube,¹ who reported seven cases of relative tricuspid insufficiency in the course of chlorosis. He points out the same clinical differences which struck me. Among the cases, which he reports were three which presented the positive venous pulse without there being any other physical signs of tricuspid insufficiency. One of these did so later and Leube expresses the opinion that all were cases of leakage through this valve, although in some instances the leak is so slight as to cause no other physical signs. He lays much stress upon the presence of systolic murmurs over the auscultation area of the tricuspid, as an important physical sign of this lesion. Such a murmur was not present in any of my three personal observations, and I may say that I have only rarely been able to find such a murmur in the common cases of this lesion.

Whether one is warranted in drawing any inferences as to prognosis from the fact that two of the three patients promptly died, cannot yet be decided. That can happen only after an accumulation of data. The fact that I have seen three such cases in the period of six months, would lead to the expectation that data will accumulate rapidly, once attention is drawn to the matter.

Since this report was made to the Association of American Physicians, I have seen a fourth case presenting the same feature:

A farmer, aged forty years, giving a history of a period of weakness and anemia one year ago, was admitted to the hospital complaining of loss of weight, exhaustion, and dyspnoea on exertion. The blood findings were those of pernicious anemia, and examination of the jugular veins showed a positive pulse. The absolute dulness of the heart was enlarged to the right border of the sternum, the second pulmonary sound was of normal intensity, and there was a systolic murmur at the apex. The liver was enlarged downward about one inch, and was not tender or painful. There was no cyanosis or dyspnoea, except on exertion, and no oedema.

¹ *Zeitschrift f. klinische Medizin*, 1905, lvii, 199.

ELEPHANTIASIS NON-PARASITICA, SECONDARY TO CHRONIC CARDIAC DISEASE AND REPEATED ŒDEMA OF PREGNANCY.

By T. W. HASTINGS, M.D.,

INSTRUCTOR IN CLINICAL PATHOLOGY, CORNELL UNIVERSITY MEDICAL COLLEGE,
NEW YORK CITY.

AN early case of enlargement of the lower limbs to a "most monstrous magnitude" from anasarca, and two cases of obliteration of the thoracic duct, probably without enlargement of the limbs, one from Valsalva (1666-1723) and one from Santorini (1681-1736), are referred to by Morgagni.¹ In 1817 Chevalier² wrote of a case of elephantiasis of the right leg following an attack of phlegmasia alba dolens, and in the same year Kennedy³ contributed an article concerning a patient observed in Madras in 1796.

Kennedy's³ patient was a male Madrasi, thirty-five years old, who had received six wounds of the left arm from a bursting match-lock. The smaller wounds healed in three months and the larger in four months, during which time much pus was discharged and the head of the ulna came away. The history after the first day was that of an infected wound. The heat, pain, and throbbing were relieved by cold applications, but the enormous swelling, which had gradually extended up his arm, never subsided, and when the wounds had healed the left arm was twice the size of the right. The arm was finally amputated.

Wormi⁵ reported a case of enlargement of the left arm consisting of distention of the veins, chronic œdema, thickening of the skin and aponeurosis, and no pus, resulting from complete obstruction and dilatation to double its size of the left subclavian vein from pressure by a yellow, hard, slightly adherent mass at the junction of the subclavian with the jugular. A similar mass pressed upon the descending portion and obliterated the outlet of the thoracic duct, and a bony pelvic tumor by pressure caused extensive œdema of the right thigh. Turner⁶ in 1859 reported two cases of complete obliteration of the thoracic duct by pressure from an aneurysm of the aorta, in one of which the area of obliteration extended from the second to the fifth dorsal vertebra, in the other it was opposite the level of the eighth dorsal vertebra.

Not until 1863 was the filaria parasite discovered by Demarquay,⁷ and not until 1874 were cases of elephantiasis arabum described by Lewis.⁸ In 1867 T. Carr Jackson⁹ reported an interesting case of elephantiasis following infection, in which the elephantoid swelling of the left thigh followed the occurrence of a large intra-peritoneal "abscess" extending transversely across the lower abdomen. Three days after recovery from the abscess the thigh began

to swell and during the succeeding six years the dilated lymph varices over the thigh occasionally ruptured and discharged.

The two excellent monographs by Samuel C. Busey,^{10 11} of New Orleans, published in 1878, included the reports referred to and reports of cases of diseased conditions of the lymph channels observed by himself and published in the *New Orleans Medical and Surgical Journal* during the years from 1876 to 1878 inclusive. Busey's two monographs are classics. In summing up certain cases of non-parasitic elephantiasis Busey¹⁰ concluded that their development depended upon some "congenital defect, from nutritive disturbances and changes taking place during intrauterine life, and some acquired factor such as local inflammation." He mentioned two forms, viz., congenital and acquired. The congenital form, resulting from congenital hypertrophy, occurs in acephalic and other monsters, is local, and affects isolated portions of the body, one or both legs, most frequently the right leg. In later life the immediate cause of enlargement may be an inflammation of the derma involving the bloodvessels and lymphatics or primarily the lymphatics, with effusion; this may result in hypertrophy beginning primarily in the subcutaneous tissue and possibly extending to and involving the other soft tissues (muscles, nerves) and the bony structures. The congenital form is usually of the type *elephantiasis mollis* of Virchow. The conclusion is inevitable (p. 165) that "blood impoverishment, a meagre diet, and bad hygiene are at least exciting agencies which call into active operation a pre-existing predisposition." . . . "These circumstances relate more especially to certain acquired forms; but a large number of these manifestly originating in some congenital abnormality are developed in after life under influences which may be regarded as exciting causes." The age of puberty is regarded by several writers as the period of most prolific development.

In the acquired forms, such as *elephantiasis arabum* (filariasis) and the condition due to repeated local inflammation and pressure upon large vessels, the tissue changes correspond to true *elephantiasis dura* of Virchow. Cholmeley¹² in 1869 reported a case dependent upon "obstructed heart circulation and engorgement of lymph channels in parts remote from the direct influence of such impediments," a condition apparently similar to that of the case here reported. A female child, the fourteenth of seventeen children, the sixteen in good health, was born at term, deeply cyanosed. Repeated attacks of dyspnoea and "inflammation of the chest" occurred during a period of from four to five years. The child was always well nourished and fat, with good, bright color in the cheeks, but easily affected by cold, and at such times complained of want of breath and a feeling of tightness in the chest, and the complexion assumed a markedly livid tint. The pulse was "normal in frequency, rhythm, volume, and force," but all over the heart was heard

a soft blowing systolic murmur loudest at the junction of the second left costal cartilage with the sternum. "During her sixth year swelling appeared over the right ankle, which gradually extended upward, though not above the knee until two years had elapsed; but in the third year when the patient was between seven and eight, the 'swelling extended slowly and steadily upward till her whole limb was implicated,' but has not gone above 'the inguinal line.' The increase in the size of the swelling was always greater toward evening, and did not affect the foot when a boot was put on when the child first got up."

"The entire limb was uniformly enlarged, felt 'soft, firm, and elastic,' the lower part being firmer and more tense than the upper; in color and temperature the limbs did not differ." . . . "The skin was smooth and soft as far down as the middle third of the leg; below it was 'harsh, rough, dry, and scaly; on the outer surface of the ankle were a number of 'soft, smooth, red, flattened papules,' not larger than a split pea. On the hypertrophied skin of the great, second, and third toes were 'rough, hard elevations looking much like a half-aborted and dried herpetic eruption, from which occasionally a discharge took place,' and over the tendo Achillis was a 'humid patch from which a milky looking alkaline fluid dripped,' similar in character to the fluid which issues through punctures made into the lower part of the limb, which exhibited under the microscope broken-up cells, granular matter, some oil globules, blood corpuscles, and 'coagulated on boiling.'"

The comparative measurements of the lower extremities were as follows:

	Left.	Right.
At the ankle	8 inches	9 $\frac{3}{4}$ inches
At the midleg	9 inches	14 inches
Below the knees	9 $\frac{3}{4}$ inches	14 $\frac{1}{2}$ inches
Above the knees	10 $\frac{1}{2}$ inches	16 $\frac{1}{2}$ inches
Upper part of thighs	15 inches	17 $\frac{1}{2}$ inches

(Child 7-8 years old)

"There was no fulness or swelling of any kind detected in the groin or pelvis; nothing abnormal in the condition of the right nympha or labium; never any pain in the limb; nor any injury, accident, or known cause to account for the condition." Of Cholmeley's case Busey states (pp. 136-138): No postmortem was permitted so we cannot "positively establish any connection between the lymph stasis, which was first apparent near the ankle, and the disturbed cardiac circulation—the cause of which was probably located in the pulmonary artery; and though it seems improbable that an obstructive force originating in the retardation of the blood current from the right ventricle could be transmitted backward along the fluid contents of the thoracic duct and lymph vessels and glands through which the lymph must pass from the lower extremity to

reach the receptaculum, yet in view of cases previously cited such explanation of the phenomena cannot be excluded."

Localization of stasis to the one extremity "must, perhaps, find its explanation in some abnormal condition of the lymph vessels of the right lower extremity, which like the cardiac defect was probably congenital . . . The early history of the swelling and engorgement shows that the accumulation was hypostatic. Movement of the fluid, according to relative elevation of the upper and lower parts of the affected limb, demonstrated the insufficiency of the valves."

In 1869 Bryk¹³ reported a somewhat similar case, dependent in part upon cardiac disease apparently acquired. A female servant, twenty years old, from her ninth year had had frequently recurring attacks of erysipelas of the left leg and foot, which in her sixteenth year eventuated in the establishment of an ulcer on the inner side of the ankle, followed by swelling and enlargement of the foot and leg, with horny and thorn-like excrescences upon the thickened and callous skin. "The heart was enlarged transversely, the area of dullness extending from the edge of the sternum to beyond the left nipple, and there was a systolic murmur at the apex. The liver extended the width of three fingers below the arch of the ribs; the spleen, as well as the submaxillary and, especially, the left inguinal glands, were enlarged and indurated." Busey¹¹ (pp. 139-140) quotes this case and relates that "the history of this case, as well as its course, apparently located the origin of the elephantiac development in the lymphatic system. In view, however, of facts primarily presented the insufficiency of the mitral valves cannot be wholly excluded as a factor in producing the stasis of the lymph."

These two cases are quoted in detail because their histories and the elephantiac conditions resemble the case herewith reported, particularly Cholmeley's case, in which there was no inflammatory condition as an exciting cause. Bryk's patient developed elephantiasis after repeated attacks of erysipelas, and the description of the scars on the affected limb suggests a difference in appearance, may be, sufficient to separate the enlargements due in part to infection and enlargements developing without infection. A second case quoted from Bryk¹¹ tends to substantiate this difference. A blacksmith, thirty years of age, gave a history of good health up to five years ago, when he suffered from erysipelatos attacks which developed in varices about the left knee-joint and later in the entire leg and in the arm. One year later the right leg was the location of an erysipelatos attack with abscess formation upon the leg and in the inguinal glands. After cicatrization of the inflamed parts at first the foot and afterward the leg "began to be thickened elephantiacally." . . . "With the exception of the funnel-shaped scars in the right inguinal region the skin of the thigh was

smooth, but in the leg were numerous scars, and in places the surface was uneven and rough on account of the densely crowded, hard nodes the size of nuts, not movable over adjacent parts . . . and furrowed by numerous rugæ passing in every direction." Sensibility was undisturbed. The glands were generally enlarged, but not painful. A strong systolic murmur was perceptible over the femoral artery of both extremities; the thoracic organs were healthy; no albumin was in the urine.

Continuance of bandaging alone reduced the volume, which increased when the bandage was not employed. After ten months the femoral artery was ligated below Poupart's ligament, "with the effect of reducing the limb to its normal dimensions in the course of two months, but another relapse soon followed."

Quinke¹⁵ reported the following case in 1875: A woman of thirty years with "peritoneal dropsy"—effusion of chyle into the peritoneal cavity—developed œdema of the right leg and forearm and elephantiac formation, probably due to disturbances of lymphatic circulation of the parts affected. The integument was tense, thickened, and the surface irregular; sometimes a clear yellowish fluid dribbled from integumentary fissures. A postmortem revealed "fatty degeneration of the heart," an inflammatory thickening of the mesentery, and cadaveric emphysema.

Of this case Busey says (p. 80): "An œdematous condition and elephantiac formation of the right leg and forearm due to the mesenteric condition, viz., an inflammatory thickening of both folds of the mesentery and transformation of the interposed adipose tissue into tense connective tissue." This case is quoted to emphasize the possible development of an elephantiasis from circulatory disturbances of the blood and lymph channels, independently of local inflammation in the extremities. A year after Quinke's report Winckel¹⁶ described a case of enlargement of the left lower extremity, similar to phlegmasia alba dolens, tense and painful, without fever, which developed during the existence of chylous ascites, from which was withdrawn by tapping a milky fluid containing filaria.

From 1878 to 1882 there are no good records of such cases in the literature. In 1882 P. zur Nieden¹⁷ published an inaugural dissertation upon a case of lymphangiectasis with lymphorrhagia affecting the labia. His quotations and views in regard to the pathological condition are referred to under the Description of the Pathological Condition.

From 1882 to 1898 the literature contains no good records of non-parasitic elephantiasis. In 1898 Jopson,¹⁸ of Philadelphia, reported two congenital cases, one at four years and one at one and a half years of age, which he considered the result of intrauterine infection and lymphangitis of the limbs. He recognized four types of the congenital condition, viz.:

Elephantiasis congenita lymphangiectatica;
Elephantiasis congenita telangiectatica;
Elephantiasis congenita fibromatosa;
Elephantiasis congenita neuromatodes.

Among the more recent cases are the following: Favarger¹⁹ (1901) reported a case of non-parasitic elephantiasis due in part to a weak heart. The man, a native of Styria, twenty-five years old, was a farmer who had never left his native country. At fifteen years of age he suffered from a left pleural inflammation which recurred during the following two years. (Edema of both feet was noted at eighteen years of age, and later chronic eczema developed. The heart action was weak, the sounds were clear. The swelling and œdema in the left leg increased until they were enormous, and the scrotum, joints, and right leg below the knee were also swollen. Favarger thought this a sporadic case of elephantiasis, without a possibility of filarial invasion, resulting from a predisposition to chronic œdema readily satisfied by the "weak" heart action which maintained a cardiac stasis as well as lymph stasis, and infection with the cocci of erysipelas or other bacteria and subsequent increase in connective tissue.

In 1902 Rolleston²⁰ reported two cases of moderate enlargement of the legs in two patients, brother and sister, the condition being a peculiar œdema of the tissues which was permanent as long as they led an ordinary life; after exercise it increased, but disappeared after rest in bed for some days. He suggested that the persistent tendency to œdema from gravitation depends upon some inherent defect or peculiarity of the small bloodvessels, which allows of excessive transudation on slight provocation.

Pokrovski²¹ (1902) reported two cases of elephantiasis due to syphilis and cited cases of syphilitic elephantiasis described by Minokoff in 1893 and by Orloff in 1901. Tschlenoff²² in the same year described a case of elephantiasis of the vulva in a syphilitic woman thirty-eight years old, who had had seven miscarriages and had been under treatment for years. He thought some other factor besides syphilis necessary to produce the condition, but made no definite statement in regard to such factors.

A case of elephantiasis dependent upon a congenital defect in the lymph-vessel system of a male child, two years old, was reported by Bernhard and Blumenthal²³ in 1902. The child was admitted to the hospital for a deformity of the external genitalia. Shortly after birth an operation for phimosis was performed, and at this time the elephantiasis condition of the left foot was noted. After operation the prepuce swelled continuously and the entire left leg developed a condition of pronounced elephantiasis, both the external genitalia and the leg presenting a furrowed, greatly thickened skin. The left leg measured from 4 to 8 cm. more than the right in corresponding parts. Surface temperature and sen-

sibility were the same in the left and the right legs, but the surface of the left was drier and harsher on palpation. Microscopic examination of the tissue showed a diffuse fibromatous change in the connective tissue and marked lymphangiectasis. The family history was excellent and there was no history or evidence of an earlier inflammatory condition of the left leg or genitals. They thought the enlargement dependent upon some congenital anomaly of the lymph-vessel system. This case resembles Friedberg's case of colossal development of the right leg, in which, the condition was extremely marked at birth, however, and deformities of the skeletal as well as of soft parts existed.

Cases of elephantiasis have been reported not infrequently in the United States, some of them parasitic in nature and imported from tropical countries where filariasis is endemic. In recent years I have seen four cases of filariasis, early cases with no change in the subcutaneous tissues.

The case here recorded seemed to me to be one having as etiological factors the chronic cardiac condition and some local lymphatic deficiency in the right leg. The history does not make clear the duration of the cardiac disease, but does exclude the probability of parasitic invasion, and the normal blood condition bears out the history. I am aware of the fact that in parasitic elephantiasis filaria embryos are rarely found in the blood. (Manson's *Tropical Diseases*, 1899, p. 466.) Entire freedom from attacks of inflammation in or repeated injuries to the right leg suggested that the local condition depends upon some defect in the lymphatics of the part affected, whether congenital or acquired it is difficult to prove. The occurrence and persistence without steady increase in size of an œdematous condition of the left leg suggest more strongly some local lymph-vessel deficiency in the right leg. The repeated occurrence of œdema during three pregnancies and the cardiac disease with several periods of broken compensation would account for the œdema in both legs, and yet not for the thick, elephantiac condition of the skin of the right leg. The case corresponds closely to the cases of Cholmeley and Quinke, quoted from Busey's monograph, cases which Busey considered due to latent congenital defect combined with accessory causes later in life, thereby producing an acquired condition depending partly upon a congenital defect.

C. W., a native of the United States, twenty-eight years of age, by occupation a silkwinder, was admitted to the Medical Dispensary, March 13, 1902, complaining of pain in the left arm and left chest.

Family History. Parents are living; mother has suffered from "Bright's Disease" and dropsy" for years; one sister has heart disease and has been under observation at the Dispensary for mitral stenosis; one brother died of consumption at twenty-four years of age; other brothers and sisters died in infancy.

Personal History. The patient was born in Freehold, N. J. When an infant the family moved to Chicago, thence to Philadelphia, thence to New York, eighteen years ago, and the patient has never been out of these four States. No illness occurred in childhood excepting measles. During the last three years she has been questioned occasionally in regard to early illness and important details, and the history given in 1902 is correct. Excepting measles, there is absolutely no history of infectious disease or of local infection. Menstruation was established during the eleventh year, and when seventeen years old she married. Five years after marriage she had been the mother of four children, one of whom died of meningitis, a second of diphtheria, a third at two weeks of age from an undetermined cause, and the fourth is living and in good health. Her husband died of pulmonary tuberculosis six years after their marriage. With each of the four pregnancies there was moderate bilateral oedema of the legs, no more marked in right than in left, but never a permanent swelling of either leg after pregnancy. During no one of the pregnancies were there signs or symptoms of femoral vein thrombosis or inflammation of the legs, and the condition of the limbs above the knee confirmed the statement. There was no fever or illness following parturition. After her husband's death she began work as a silk-winder, which necessitates constant walking to and fro, and within two years' time the right ankle began to swell during the day, the swelling subsiding at night, and gradually over a period of one and a half years the leg below the knee became much enlarged. For four years the permanent swelling has been slowly increasing.

There has been no urinary disturbance and the urine has never been milky.

Present Illness. Four days before admission (March 13, 1902) she was suddenly taken with a sharp, darting pain in the lower left chest, which after from two to three hours extended to the left arm and was sufficiently severe to prevent sleep. There was dyspnoea after exertion. For two weeks the left chest had felt uncomfortable and the left foot had swollen. There was "increased" urination; no cough.

Examination. The lower eyelids were puffy, the pupils dilated, and the eyes deeply dark-ringed. The tongue was lightly coated. Thorax well formed, sternum straight, and lungs normal throughout.

Heart. The apex-beat was visible in the fifth space 10 cm. from the midsternum; the maximum impulse was 11 cm. from the midsternum in the fifth space, well outside the midclavicular line. There was no thrill and the shock of the first sound was felt. The area of relative cardiac dulness was enlarged to the left and extended not quite to the sternal border to the right. Cardiac pulsations were 114 to the minute. At the apex a blowing

systolic murmur, soft and of short duration, was heard; in the fifth space, from 11 to 12 cm. from the median line, there was a loud rumbling diastolic murmur, not constant; and mesial to the maximum impulse a loud, high-pitched blowing diastolic murmur was constantly heard; this murmur increased in intensity toward the aortic area, was audible though less distinct at the left of the sternum in the second interspace, and loudest in the third and fourth interspaces to the left of the sternum. The tricuspid area was clear. The second aortic sound was obliterated, the second pulmonic sound was not accentuated. The pulse was full, large, quick, not

FIG. 1



To the right, C. W., aged twenty-eight years, the subject of non-parasitic elephantiasis, aortic insufficiency, and rheumatic purpura. To the left, M. A., aged twenty-four years, a sister of C. W., and a subject of mitral stenosis (the legs and thighs normal). Photograph taken March 27, 1902.

typically Corrigan. There was a well-marked capillary pulse in the finger nails, and a well-marked Riesman-Müller sign upon examination of the throat.

The right leg from the knee down was greatly enlarged, measuring 58 cm. in the largest circumference in the middle third of the calf; the enlargement was fairly regular and uniform (Fig. 1). The surface was smooth, with the exception of a pitted area 2 cm. in diameter, suggesting a scar near the lower third anteriorly, and exaggeration of the skin folds near the ankle. Over the posterior surface (Fig. 2) were scattered six small pitted areas, the skin covering which was

in no way different from that over the remainder of the leg. The skin was markedly thickened, boggy, but not tense, and did not pit on pressure as did the simple edematous left leg, nor was the skin rough and harsh as in filarial elephantiasis. There was no local temperature, no swelling, no tenderness. The hair overlying the anterior surface particularly was long and had been "frequently cut off." The patient stated that after standing or walking the right leg was as hard as a rock and the bandage worn about the swollen calf became "saturated with water." Scattered over the surface were a few dilated venules. The left leg presented a moderate edema and some thickening of the soft parts, and also a pitted scar over the lower third anteriorly. The greatest circumference of the left calf was 34 cm. The edema existed over both feet and in the left limb up to the lower third of the thigh. The bony structures about the right knee-joint were evidently enlarged and thickened, particularly the condyles of the tibia.

The thickening of the skin did not suggest scleroderma.

Abdominal Examination. Pelvic and abdominal examinations were negative. The cardiac condition was treated, with no change in the size of the right leg, but with partial disappearance of the edema in the left leg.

The history and the preceding examination were recorded on March 13, 1902. Two weeks later, on March 27, she returned, with a history of pain and soreness across the abdomen for three or four days, some pain in both knees, ankles, and bones of the forearms. There was no chill, no fever, no vomiting or nausea, but sweating and severe headache. There was no bleeding from the nose, mouth or bowel, and the urine had been normal in color. Thirty-four hours before the visit and two days after the onset of pains in the joints she suffered from a sudden attack of intense pain in the left side of the abdomen, and bright-red spots appeared on the thighs and upper legs, most abundant about the knees, also on the dorsal surfaces of the forearms and wrists. On examination the spots were dark purple-red, in size from 1 mm. to a blotch from 2 to 3 cm. in diameter. The knee-joints and inner sides of both thighs were tender. The swelling of the legs had not changed.

The abdomen was tender in the upper zone, otherwise negative. The lungs were normal.

The cardiac area had decreased, the maximum impulse being 9.5 cm. from the midsternum in place of 11 cm. on March 13th; the loud diastolic aortic murmur replaced the second aortic sound and the pulmonic second sound was intensely sharp and accentuated. The pulse was 90 to the minute, quite regular in rhythm and force.

At this visit the photographs were taken, and the purpuric spots are clearly defined (Figs. 1 and 2).

The two blood examinations had shown a normal blood condition, with the exception of a slight increase in the erythrocytes; hemo-

globin, 88 per cent.; red blood corpuscles, 5,600,000; white blood corpuscles, 8000. Differential count of the leukocytes (300): polymorphonuclear, 71 per cent.; lymphocytes, 21 per cent.; large mononuclear, 8 per cent.; eosinophiles, 0 per cent.; mast cells, 0 per cent.; parasites not found.

January 19, 1904. The patient returned after an absence of twenty months, with the following history: On June 10, 1903, after a fall, when she bruised the inner side of the enlarged right calf, "gangrene set in." She was taken to a hospital and remained there three months, until September, 1903, since when she has visited the hospital twice weekly to have the last wound dressed.

FIG. 2



Rear view of C. W., non-parasitic elephantiasis.

Three operations were performed under cocaine. At the first "pus" was obtained, but later the discharge became serous, as it is at present. At the time of the operations her medical attendants stated that the skin was one and one-half inches thick.

She complained again, (January 19, 1904) of dyspnoea, aching in the arms and thorax, and of excessive "pounding" of the heart. General health had been excellent. The oedema of the left and enlargement of the right leg had not increased. The cardiac area had again extended, there was a diastolic rumbling murmur at the apex in the fifth interspace from 10 to 11 cm. from the midsternum, and a loud diastolic aortic murmur most intense in the third and

fourth spaces along the left sternal border. The tricuspid area was clear. The pulse was large, quick, regular in rhythm. The lungs were normal. Abdominal examination was negative.

The œdema of the left leg about the ankle was moderate. The dressing about the right leg below the knee was wet with a sticky, serous fluid. There was no thickening or dilatation along the veins of the right leg, and nothing abnormal about the genitalia.

The measurements of the two legs were:

	Right.	Left.
Ankle	26 cm.	18 cm.
Two inches below knee	44 cm.	
Three inches above knee	37 cm.	
Largest measurement of calf		36 cm

Above the right knee, in lower third of thigh, the skin was slightly thickened. The left leg was œdematous from knee to ankle, and œdema extended to both feet. The right leg had become much reduced in size, the largest measurement of 44 cm. being 14 cm. less than the 58 cm. of March 13, 1902.

The patient's last visit was in March, 1905, for the cardiac condition, and at that time the operation wound of June, 1903, had not healed, the condition being that of a fistulous opening discharging serous fluid, similar to the conditions of lymphorrhagia or lymphorrhœa recorded by Busey,^{10 11} by Fischer,²⁴ and by P. zur Nieden.¹⁷

This constant discharge of serous fluid undoubtedly accounts for the reduction in size of the right leg, from 58 cm. in 1902 to 44 cm. in 1904 and 1905. At no time has a milky discharge been noted, although she was requested to look for it. The serous discharge has in no way affected her general health, which is good. She still follows the occupation of silk-winder, and responds readily to treatment when the cardiac condition loses its compensation.

It has not been possible to obtain a section of tissue for histological study. There seems no doubt, however, that the condition is dependent upon the repeated œdema during four pregnancies, leading to dilatation and may be insufficiency of the valves of the lymph vessels, the cardiac disease, with its consequent attacks of stasis, the patient's standing occupation, and possibly some congenital deficiency of the lymph-vessel system of the right lower extremity. History and evidence of infection are wanting, and fortunately infection has not occurred since the operations in 1903.

Aside from bandages properly applied, rest with elevation of the limb when possible, and massage, the treatment has been directed to the cardiac disease.

DESCRIPTION OF THE PATHOLOGICAL CONDITION.

Allard,⁴ in a brochure entitled "*De l'inflammation des vaisseaux absorbant lymphatique*" (Paris, 1824), defined elephantiasis as

a "chronic inflammation of the lymphatics of the affected part and ultimately of the remainder of the body."

Busey¹⁰ accepted Virchow's description of the changes in the tissues and recognized an elephantiasis dura, in which a connective tissue of stiff, glistening, white fibers, very firm and almost scirrhus, was found in place of the soft parts; and an elephantiasis mollis, in which the enlarged parts consisted of a soft, gelatinous, uniform tissue. Busey quoted Kaposi as stating that the two changes were not indicative of distinct diseases, and again quoted Kaposi and Tillbury Fox in regard to the fluid found in these tissues, the former considering it a "fibrinogenous" substance, the latter stating it to be lymph.

P. zur Nieden¹⁷ in a monograph considers in detail the genesis of elephantiasis depending upon lymphangiectasis resulting from inflammation. With the initial and prodromal erysipelatous skin inflammation the lymph vessels and glands take part, and thus thrombosis of the lymph vessels and blocking of the glands due to cell-growth accounts for a mechanical lymph stasis. Retention of "tissue juice" is a source of irritation and furnishes material for hyperplasia. Quite the contrary is Wernher's²⁵ view that the lymph vessels in no place, either capillary or in the glands, are blocked, but the stasis of lymph has ground only in the varicose dilatation, and hereto is the elephantiasis secondary. As a cause for varicosities (lymphatic) Wernher considers gravity the first, as with venous varices. Lallement²⁶ accepts an atony of the lymph-vessel wall in consequence of repeated erysipelatous attacks as the most important etiological factor. Schliz,²⁷ after examining the skin from a case of elephantiasis, concluded that the obliteration of lymph vessels of deeper layers occurred through endothelial growth of the walls, and he quotes Virchow²⁸ as noting the similar endothelial growth in elephantiasis without an explicit statement as to obliteration. Rindfleisch,²⁹ in a case of pachydermia lymphangiectatica scroti, found a hyperplasia and neoplasia of musculature, and thought the lymph-vessel branches to be compressed by contraction of this muscle. Nieden could not explain the absence of elephantiasis in cases with well-marked lymphangiectasis. Nieden's article contains sixteen careful analyses of lymph from cases of lymphorrhagia.

Jarisch³⁰ in *Nothnagel's System* describes elephantiasis as resulting from a chronic circulatory disturbance particularly of the lymph system or thoracic duct, accompanying and beginning in acute inflammation and resulting in hyperplasia of the subcutaneous connective tissue. The condition (p. 839) often depends upon recurrent erysipeloid inflammations, phlebitis from lupus, syphilitic ulcerations, ulcers of the foot, and filarial invasion. All of these acquired forms are classified under elephantiasis arabum and separated from the congenital forms, viz., elephantiasis telangiectatica, ele-

phantiasis lymphangiectatica, and the neurofibromatous conditions. The acquired elephantoid condition occurring without inflammation is not mentioned.

Neisser and Jadassohn³¹ state that with venous stasis there occur purulent inflammation and connective-tissue hyperplasia of the lymph-vessel system, resulting in the condition called elephantiasis, particularly after recurrent erysipelas (p. 74). Often a true elephantiasis follows a ring-ulcer of the leg. Three forms are recognized, all consisting of a chronic hyperplasia of subcutaneous connective tissue, with more or less œdema and venous hyperæmia:

(a) Elephantiasis nostras;

(b) Elephantiasis of tropical regions;

(c) Elephantiasis-like forms of connective-tissue tumor occurring as congenital deformities in contrast to the acquired forms (a) and (b).

Elephantiasis nostras results from a chronic or recurrent inflammation combined with stasis in the lymph- and bloodvessels occurring with chronic eczema, chronic ulcerations, lupus, syphilitic tumors, phlebitis, lymphangitis, and particularly with erysipelas due to the streptococcus (Boeckardt). Sometimes (p. 227) chronic œdema without history (carefully taken) of earlier erysipelas (although erysipelas may be afebrile and mild; Reclus' "Halzphlegmonie" equals bacterial infection without fever) may be the apparent cause; and more rarely the condition may be postoperative or neuropathic, with neuritis or paraplegia. This type (a) affects usually the legs; more rarely the arms, scrotum, labia majora, and the face in tuberculous and syphilitic conditions. There is also a form (p. 229), not to be confused with (c), which is congenital in origin, due to intrauterine streptococcus infection of the fœtus from an erysipelatous mother.

The tropical form (b) is due to *Filaria humani*. The group (c) of congenital connective-tissue tumors, or tumors having a congenital "grundlage," best called fibromas, are often boggy and tumor-like thickenings of the skin, of which three types are to be recognized:

Elephantiasis telangiectodes;

Elephantiasis lymphangiectodes;

Elephantiasis with involvement of the peripheral nerves, equal neurofibroma. ("Dystrophie arélateuse héréditaire" and "troph-aréle chronique héréditaire".)

Clinically (p. 227) the four following conditions are to be recognized:

Elephantiasis glabra (smooth);

Elephantiasis nigra (spotted and dark);

Elephantiasis verrucosa sive papillaris;

Elephantiasis lymphangiectodes (with lymphorrhœa).

Fischer's³⁴ monograph in one part (1901) discusses thoroughly all phases of disease of the lymph vessels, and for a complete bibliography the reader is referred to his publication (pp. x-xiv). At the end of the eighteenth century the normal anatomy of the lymph-vessel system had been carefully described by Henson, Mascagni,

and Cruikshank; and Assalini and Sömmering had explained disease processes on the theory of interruption to the flow of lymph through the lymph-vessel system. Later, Allard and Andral concluded the disease processes to be due to inflammation, and this view was upheld by the French school—Velpeau, Breschet, J. Roux, Chassaignac.

During the last eighty years acute inflammation, tuberculosis, and malignant tumors of the lymph vessels have been reported. Fischer separates the acute infectious conditions into two groups, *A* and *B*:

A. Lymphangitis superficialis,

1. *Lymphangitis truncularis (ascendens).*

(a) Simple acute form;

(b) Purulent subacute, involving the larger collected bundles of vessels, in surgical blood poisoning and glanders.

2. *Lymphangitis reticularis*, involving the net-work of vessels in the skin: subepidermal, dermal, or subdermal lymph vessels, conditions often not distinguishable from erysipelas, although they develop no indurated line of demarcation as does erysipelas; and

3. *Lymphangitis gangrenosa.*

B. Lymphangitis profunda, involving the deeper tissues.

The chronic inflammatory conditions are not specific but result from failure to destroy the source of irritation from an old infection in ulcers and chronic inflammations leading to recurrent lymphangitis. Fischer recognizes two types, viz.:

(a) *Reticularis (chronic);*

(b) *Truncularis (chronic).*

The course of chronic inflammation of large vessel trunks is without pain. The lymph circulation of the area affected is hindered and the collateral circulation is not in function; this condition results in an oedematous swelling peripheral to the area in which the lymph vessels are blocked, sometimes with lymphangiectasis. Particularly if deprived of treatment are the cases of "Strang" (ascending), lymphangitis prone to result in "elephantiac" changes, since the walls of the vessels, closed by endothelial hyperplasia or by thrombi, undergo a fibrous connective-tissue degeneration which involves the neighboring and enclosed connective tissue and the smaller vessels, particularly the smaller veins.

Dilatation of the lymph channels, *i. e.*, lymphangiectasis, and the formation of lymph varices and lymphangiomias are often congenital afflictions, appearing with birth or soon after birth. (Fischer quotes Patterson and Busey.) The development of lymphangiectasis may occur later in life and these cases fall into two groups, separated etiologically into

A. The tropical, due to invasion of the lymph channels by *filaria sanguinis*;

B. The non-parasitic, spontaneous, or after occlusion of lymph channels.

This group of cases has its origin in an external or internal obstruction to the on-flow of lymph from the distal portion of a part, in consequence of which the lymph-vessel content is under abnormally high pressure, so that a bulging of the wall occurs. Interruption of the stream can give rise to contracting pathological changes resulting in marked narrowing of the lumen.

Repeated (recurrent) lymphangitis and erysipelas lead to thrombosis and complete occlusion; or complete occlusion may result from neoplasm of parts (cancer, Richet), or from endothelial hyperplasia (C. O. Weber), or from chronic infection (tuberculosis, Goupil), or from invasion by parasites (*Filaria*, Lewis, Mazéa-Azema, Scheube). Occlusion may result from external pressure after injury and inflammation which in healing have left a contracting, shrivelling, extending scar (Patterson, Klebs); from tumors gradually increasing in volume in the neighborhood of vessels (Busey); in extensive ascites (Know and Egger). Destruction of lymph-vessel area from acute and chronic suppuration of lymph glands, after extirpation of glands, trauma directly affecting the vessels, as in fracture, extensive section of the soft parts (Trélat, Ledderhose) can lead to obstruction to on-flow and subsequently lymphangiectasis. To other authors the difficulty of reflux of lymph into the venous system, arising from abnormally high pressure in consequence of heart disease, congenital stenosis of the venous ostia, and other obstructions to the circulation, suffices to explain the development of dilatation. In such cases the dilatation is confined to the thoracic duct and the large trunks of the thorax and abdomen (Rokitansky, Löschner), or more rarely the peripheral lymph vessels may also become dilated, particularly those of the thigh and genitals (Petters, Simon). Wright believes that the development of lymph varices may depend upon an abnormal increase of vessel content, without previous inflammation of vessels or glands. Bean and Emmert consider paralysis of the muscularis of the larger lymph vessels a possible cause of dilatation. Unna considers the lymph-vessel dilatation the result of two factors, a hindrance to lymph-flow and to blood-flow, the latter being a pressure which works against the natural blood stream, leading particularly to stasis of neighboring veins. Stasis and retention of lymph do not always lead to dilatation, for collateral circulation may be good. Experimental stasis of ductus and larger vessels does not always lead to dilatation (Magendie, Dupuytren, Conheim); obliteration of the vessels of an extremity does not result in lymphangiectasis (v. Lesser); nor does dilatation often follow extirpation of glands. Accordingly, Langhans, Torock, and Nasse take the view that proliferation processes in the lymph-vessel walls play the greatest part in the production of dilatation.

Fischer does not lay much stress on proliferation processes, but takes the view of v. Esmerch, Kulenkampf, and others, that lymph

varices arise only when vessels over a large area are obstructed, are overfilled, and the wall elasticity is thus injured and the valves become inefficient, either from dilatation alone or from inflammatory changes.

One may compare these with venous varices and accept a congenital "anlage," which is to be looked for in an abnormal width and flabbiness of the lymph-vessel walls, which readily lend themselves to the development of dilatation through stasis.

The two forms of lymphangiectasis, (1) reticularis, and (2) truncularis, often occur together.

1. Lymphangitis reticularis consists in a dilatation of vessels and capillaries (and "Wurzelgebiete") leading to a "pachydermia lymphangiectatica," in which the outer epidermis is the primary site, the hypertrophic process in the cutaneous and subcutaneous tissues resulting secondarily from the irritation arising from the primary lymph stasis (Kulenkampf, v. Winiwarter, A. Fischer, Teichmann).

On the normal thickened, sometimes pigmented, skin one finds small blebs, which, after being emptied of their fluid contents, have a sharply defined border. On section one sees close under the papillary layer endothelial cell spaces and widened papillary lymph spaces communicating with a net-work of dilated lymph vessels in the skin and subcutaneous tissue. The "spaces" extend to the point of the papillae and are separated from a thin epidermal by a thin connective-tissue layer, in some more extensively dilated; the connective tissue is atrophied so that the endothelium is in contact with the epidermal layer; the content of the spaces is usually fluid, sometimes with finely granular net-work masses—the coagulated lymph—which contains the few nucleated lymphoid cells. The sebaceous and sweat glands and hair follicles as well as the papillae are compressed, whereby atrophy of these structures arises. Bloodvessels completely unchanged or dilated project as bulgings into the spaces; through rupture of these vessels the contents became sanguineous. In the papillary and subcutaneous layers irritation is evidenced by a variable high grade of round-cell infiltration.

2. In lymphangitis truncularis the vessels above and below the fascia of the part are involved; either small sections of a trunk are partially dilated, or the dilatation extends along the whole length in a cylindrical or serpentine form. Changes in the vessel wall at the dilated area show lack of growth of the muscularis (Anger). Nieden states the contrary, but the musculature is strong in growth in the slightly dilated portions; clear statements are wanting in regard to the relations of endothelium, intima, and elastic fibers. The number of valves is lessened, the length of those present reduced and insufficient, whereby the turgescence of the varices on standing and walking occurs without hindrance. The widening, bulging, and thickening of the vessel walls occur most often without symptoms.

The dilated lymph vessels at times can be rolled under the fingers. Often lymphorrhagia or lymphorrhœa is the first symptom or sign, the fluid amounting to a few grams or many pounds in a day. Pressure below a fistula in such a case, on standing, increases the flow. The output depends in part upon the opening, often small and fine (Klebs and Tillmann), or may be a flow or exudation from between the epithelial cells (as in the case here reported) without a fistulous opening, and again large fistulae which admit a sound and communicate with large spaces. Thus one may find normal skin, or more or less pigmented, hypertrophic, elephantiac changes in the skin, with small flaxseed or pea-sized simple or confluent blebs which contain clear, milky, or sanguineous fluid. The fluid is lymph and related to chyle (Neiden, v. Esmarch, Kulenkampf). Excessive loss of it may lead to emaciation, weakness, and death. Munk and Rosenstein reported a case with a fistula on the inner side of an elephantiac left leg, which in hunger discharged a clear, slightly opalescent fluid, and after digestion of a fat meal a milky fat-droplet chyle. These varices of lymph vessel net-work may extend over an entire extremity; in such cases hypertrophic changes in the subcutaneous connective tissue result in elephantiasis (v. Winiwarter).

I am indebted to Dr. E. S. Loiseaux, of Morristown, N. J., for the following account of the condition found at operation.

"S. W. was admitted to the hospital with a subcutaneous abscess in the right leg posteriorly. The abscess was secondary to a skin abrasion, received over its site two weeks previously to admission. On incision the skin itself was very much thickened and the pus cavity was several inches in diameter and two or three inches deep, possibly a little more.

This cavity seemed to be immediately beneath the skin proper, in the superficial fascia—I could not say that it extended down to the deep fascia. The skin itself was about three-eighths of an inch thick and its toughness kept the abscess from spontaneous evacuation.

As far as the hypertrophy is concerned I should say that it was nearly all in the superficial fascia or subcutaneous tissue. . . . I considered the whole condition one of lymphœdema, as it appeared in the puerperal period. At this time the blood was examined night and day for filaria and none were found."

With Dr. Loiseaux I believe the condition dependent in part upon "lymphœdema" of pregnancy, and the subsequent hypertrophy of the skin and subcutaneous tissue, in the right leg and not in the left, due to chronic lymph stasis dependent upon lymph-vessel deficiency, probably congenital, as suggested by the earlier observers quoted in this article.

Unfortunately it has not been possible to obtain tissue for microscopic examination.

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RESULTS OF THE BITERMINAL TRANSPLANTATION OF VEINS.

By ALEXIS CARREL, M.D.,

AND

C. C. GUTHRIE, M.D.,

OF CHICAGO, ILLINOIS.

(From the Hull Physiological Laboratory, University of Chicago.)

THE first series of experiments performed demonstrated that by interposing between the two cut ends of an artery a segment of vein it is possible to restore quickly the arterial circulation, and that the venous segment is able to perform the principal arterial functions. A summary of the immediate results of this operation,

together with the main conclusions to be drawn therefrom, have already been published.¹

After finding that a venous segment transplanted on the arterial apparatus adequately supported the blood pressure, we tried to determine to what extent such a segment would acquire arterial characters. It is well known, indeed, that the function and development of an organ are intimately associated, and that even in adult animals an organ or tissue may be caused to undergo extensive anatomical and physiological development. It might be assumed, therefore, that a vein acquiring the functions of an artery would become arterial in all its characters. But as we believe this method of transplanting veins may be used in man, as in the treatment of large wounds of arteries and aneurysms, we consider it necessary to determine carefully the permanent effects of the arterial blood pressure on the venous wall, before this application is made.

A second series of experiments was performed. Three dogs were operated on under aseptic technique. Two of the animals were etherized and the results of the operations studied six and fourteen days respectively after the operation. The third animal was kept alive. By examining it over a long period of time it may be possible to determine the permanent results of the operation.²

EXPERIMENT I. Transplantation was made of a segment of the femoral vein between the two cut ends of the femoral artery. The ends of the venous segment were dissected and transplanted on the artery, but all the middle portion was permitted to retain its normal connections, including its collaterals. After the circulation was re-established these collaterals became similar to small collateral arteries. It was therefore an incomplete biterminal transplantation.

EXPERIMENT II. Complete biterminal transplantation was made. A long segment of the external jugular vein was dissected out and completely extirpated and put in a glass of isotonic sodium chloride solution. Afterward the carotid artery was dissected and severed. The venous segment was interposed between and united to its cut ends, and the circulation re-established.

EXPERIMENT III. Same as Experiment II.

PHYSIOLOGICAL RESULTS. Immediately after the re-establishment of the circulation in an artery after the interposition of a segment of vein in its course the circulation through the portion of the artery peripheral to the venous segment is somewhat modified, the pulsations being weaker. In a case of interposition of a very long segment of the jugular vein, between the cut ends of the carotid

¹ Anastomosis and Transplantation of Bloodvessels, Amer. Med., 1905, vol. x, 284, 1101.

² This paper has been delayed in transmission. Since it was written numerous vascular transplantations have been performed. These operations have shown that the arteriovenous anastomoses remain in excellent condition twelve months after the operation, and that the modifications of the venous wall are constant and proportional to the increase of blood pressure. All the subsequent observations have confirmed the results given in this paper.

artery with excellent restoration of circulation, the pulsations of the artery distal to the segment were almost imperceptible to the touch, while between the segment and the heart the pulsations were strong. Manometric tracings of the arterial blood pressure and pulse central and distal to the venous segment showed marked differences in the case of the pulse, the distal tracings being the weaker, while the blood pressure was the same in both cases. This effect on the pulse was probably due to the semicircular shape the segment assumed, owing to its great length compared to the length of the interval it occupied between the ends of the artery. These observations were made about two hours after the operation. In order to ascertain what changes, if any, take place in the circulation longer intervals after the operation, the animals aseptically operated upon are being studied.

The first dog was examined the fifth and sixth days after the operation. The pulsations of the distal end of the femoral artery remained weaker than the pulsations of the corresponding point of the femoral artery of the other limb.

The second dog was examined the fifth, the thirteenth, and the fourteenth days after the operation. On the fifth day the pulsations were markedly weaker distal to the venous segment than between it and the heart, but on the thirteenth and the fourteenth days no difference in the pulsations on the two portions of the artery could be detected by a clinical examination. Immediately after this examination the animal was etherized and the artery exposed and dissected from the surrounding tissues. Direct examination confirmed the results of the clinical or external examination regarding the similarity of the arterial pulse above and below the venous segment.

Blood pressure and pulse tracings taken from the artery distal and central to the segment and recorded by a mercury manometer revealed no difference in the former and only slight differences in the latter.

It may, therefore, be concluded that the physiological differences in character of the arterial circulation distal and central to the venous segment present immediately after the operation are soon modified. This indicates the occurrence of adaptive anatomical changes in the segment.

On the third dog, the pulsations of the venous segment were easily detected by palpation and its wall seemed greatly thickened.¹

ANATOMICAL RESULTS. Macroscopic Examination. The anatomical changes in the wall of the venous segment probably begin very soon after the operation, but for some days they cannot be detected macroscopically. On the sixth day the venous wall

¹ At the present time, eight months after the operation, this dog is in excellent health, and the circulation is very active through the venous segment, which to the touch exhibits the characteristics of the carotid artery.

appeared normal in size and structure. By palpation no thickening of the wall could be detected. It had altered in hue, having become almost as white as the wall of the femoral artery. The distal anastomosis only was studied. The line of suturing was still easily seen. The union appeared to be directly between the ends of the vessels. A longitudinal incision was made through the wall of the venous segment, the distal anastomosis, and the wall of the artery for some distance in order to expose the endothelium and different coats of the vessel. The endothelium appeared normal and the point of anastomosis smooth and regular. The line of union was not visible, being concealed by an extremely thin flesh-colored ring. This appeared to be a sheath of organized fibrin of about the thickness of a thin cigarette paper and about 1 millimeter wide, excepting at one point, where it was almost 2 millimeters in width. In order to determine the cause of this inequality, a portion of the ring was carefully removed with the point of a scalpel. Then it was seen that the endothelium of the vessels was not perfectly approximated at the point of greatest width of the ring and that the intervening gap was filled with fibrin. The ring of fibrin was so thin and so tightly adherent to the wall of the vessel that thrombosis or other hindrance of any consequence to the circulation was not to be feared.

The probable explanation of the deposit of fibrin, on the basis of Morowitz's work on the coagulation of the blood, is that at the line of union of the cut ends of the vessels more or less thrombokinase, the amount depending on the degree of perfection of the approximation of the intimas, came in contact with the blood, and with calcium reacted with thrombogen, and thrombin was formed. This in turn acting upon the fibrinogen produced fibrin, which, owing to the comparative roughness of the interior of the blood-vessel at the line of anastomosis was then deposited as a ring. The size of this ring at any given point was directly proportional to the amount of coagulation, which in turn depended upon the amount of thrombokinase present. This fibrinous ring probably served a dual purpose: (*a*) by limiting the entrance and escape of thrombokinase into the circulation, thus rendering extensive intravascular coagulation improbable, and (*b*) by preventing hemorrhage into the surrounding tissues or into or between the coats of the vessels.

The dog examined fourteen days after the operation showed more profound changes in the character of the bloodvessel than the one examined on the sixth day. The appearance and the structure of the venous segment was greatly altered.

The segment appeared as a dilated portion of the carotid artery, which tapered abruptly at both ends, there being only a very slight thickening of the artery at the point of anastomosis. The line of union was concealed by a thin sheath of connective tissue. The

external diameter of the venous segment was about twice as great as that of the artery. In hue it appeared the same as the artery. Surrounding it was a sheath of loose connective tissue similar to the external sheath of the artery. As the sheath was not adherent to the surrounding tissues the dissection of the segment was not more difficult than that of the artery.

The lumen of the venous segment and of the artery was exposed by a longitudinal incision through the walls. The diameter of the lumen of the venous segment was greater than that of the artery, but it was less than at the time of the operation. Near the points of anastomosis the diameter of the lumen of the venous segment became less than in the middle portion. A few longitudinal folds of the intima were observed. The endothelium was apparently normal, being white and glistening. The lines of union of the blood-vessels were covered by sound endothelium. The union appeared complete excepting possibly at one small point where a minute patch of fibrin was very tightly adhered to the wall of the venous segment. It was entirely confined to this small area, and when later examined microscopically it was seen to be organized and apparently being absorbed. It occurred at the anastomosis next the heart.

After being cut, the segment remained open like an artery. The macroscopic examination of the wall revealed great changes. It appeared almost three times as thick as the wall of the artery, and to be composed of an external and an internal part. The two parts were strongly united but they could be separated by careful dissection. The internal part had the appearance of an arterial wall, its tissues on section being very light in color and very dense. The external part of the wall was almost four times as thick as the internal. Its tissue was darker and less dense than that of the internal part. It appeared to consist of connective tissue.

Microscopic Examination. After finishing the macroscopic examination a longitudinal strip was removed from the lower end of the specimen, the incision being carried through the deposit of fibrin. The strip was two centimeters long; about one-fourth of its length consisted of artery and the remainder of the venous segment, the two being united at the point of anastomosis. After being fixed, embedded, cut, stained, and mounted, it was examined. Owing to the lack of time, only the hematoxylin-eosin stain and Unna's orcein stain for elastic fibers were used, and the examination was principally with a view to determine the relative thickness of the wall at different points and what coats were involved. In addition, all conditions observed that were considered of interest, are included in the description. Unfortunately the normal jugular vein removed from the animal was lost. So no absolute statements as to the increase in thickness of the wall can be made, but assuming that normally it was one-third the thickness of the carotid artery,

which is a conservative assumption, the changes are enormous. For our present purposes, absolute measurements are unimportant, only *progressive or regressive changes, relative dimensions and tissues involved* in the changes being considered the points essential to determine.

Arterial Part. Beginning at the portion of the artery appearing in the specimen farthest from the point of anastomosis, the wall was 0.71 mm. thick and normal. The thickness and structure remained the same until a point about 5 mm. from the point of anastomosis was reached. Then the thickness began gradually to increase until at the point of anastomosis it was 1.19 mm. From this point back to the point where the thickening began, a wedge-shaped layer of granular material, in which were embedded scattering cells and fibers, was present between the middle and outer coat of the vessel. This largely accounts for the increase in thickness, the base of the layer of granular material being about 0.45 mm. wide.

The intima of the artery appeared normal. At the point of union with the venous segment it was bent outward with the middle coat toward the adventitia and appeared to form an anatomical union with the intima of the venous segment which was similarly bent. It was difficult to detect the exact relation of the intimas to each other, owing to the highly organized patch of fibrin present at the point of union.

The tunica media of the artery appeared to consist of an inner portion 0.28 mm. thick, composed of muscle fibers and elastic tissues, and an outer portion 0.09 mm. thick, mainly consisting of densely arranged elastic fibers, the total diameter of the coat being 0.37 mm. The reason for considering the outer layer of elastic tissue as a part of the middle coat is that the separation of the coats caused by the layer of granular material before mentioned occurred between this and the outer layers. Possibly it represents the layer sometimes described as the tunica elastica externa of Henle. The muscular layer ended near the point of anastomosis, by losing its muscular fibers, the elastic fibers becoming very densely packed and ending in a whorl around the silken ligature present in the end of the artery. The coat of fibrous tissue just external to the muscular coat also sent some fibers to join the whorl about the ligature, but for the most part the fibers ended abruptly. The corresponding coats of the wall of the venous segment ended very similarly around the ligature in its end, and the two whorls of fibers thus formed were connected by a well-developed band of fibers, which appeared to be continuous with the fibers in the inner portion of the muscular layer of the artery.

The tunica adventitia composing the remainder of the thickness of the arterial wall consisted mainly of connective-tissue fibers. In a zone near the outer margin of the coat, the fibers appeared denser, and among them were intermingled some elongated cells having

large nuclei. In the region of the anastomosis this layer became very prominent, the fibers much denser, and the nuclei more numerous. It was continuous with a similar layer in the outer coat of the venous segment.

These results confirmed the conclusion based on the macroscopic examination that the wall of the artery was practically unaltered, excepting immediately at the point of anastomosis.

Venous Part. At the point of anastomosis the wall of the venous segment was approximately of the same thickness as the wall of the artery. From this point it very gradually increased in thickness for about 1.7 mm., at which point it was 1.57 mm. thick, which is slightly more than the thickness of the normal arterial wall. From this point it increased in thickness until a point about 6.0 mm. from the anastomosis was reached, where it was 2.88 mm. thick. From this point to the end of the specimen the wall was practically uniformly of this thickness.

The intima appeared uniform, being very similar to that of the artery in thickness. In the region of the anastomosis it was beneath the patch of fibrin and appeared to terminate, as before described, by uniting with the intima of the artery. The patch of fibrin measured 2.45 mm. in the longitudinal direction of the vessel and 0.48 mm. in thickness at the thickest point, which was near the point of anastomosis. It tapered gradually to a point at the other end. It appeared to be highly organized, consisting of a mass of cells which a band of fibers, about 0.22 mm. broad, and mainly from the muscular layer of the middle coat of the artery and vein, penetrated for some distance. The presence of these fibers rendered a definite statement as to whether or not the two intimas were directly united impossible, as they occurred at the point where the inner coats came the nearest together. In the centre of the organized mass an area 0.22 mm. by 0.64 mm., composed mainly of what appeared to be homogeneous blood pigment, occurred. This was the only sign of retrogressive change that could be detected. The free surface of the mass was absolutely smooth and regular.

The tunica media of the segment appeared to consist of two layers: an inner composed of muscle cells and longitudinal elastic fibers, and an outer consisting mainly of coarse, longitudinal, white connective and elastic fibers. In neither case were these layers as dense as the corresponding layers in the artery. At the point 1.7 mm. from the anastomosis the muscular layer was about 0.11 mm. thick and the fibrous layer 0.54 mm. At a point about 11 mm. from the anastomosis the former was 0.21 mm. and the latter 0.48 mm. At the anastomosis the muscular layer terminated mainly by sending elastic fibers to intermingle with similar fibers of the muscular coat of the artery, the muscle cells gradually disappearing. The fibers of the outer layer formed a dense whorl around the ligature situated at the end of the vein.

The adventitia also appeared to consist of two layers. At a point 1.7 mm. from the anastomosis the inner was 0.45 mm. and the outer ones 0.47 mm. thick, while 11.0 mm. from the anastomosis, they were 1.74 mm. and 0.46 mm. respectively. The outer layer was composed principally of loose connective tissue, which was continuous with the corresponding layer of the artery. The inner layer was continuous with the outer portion of the granular mass lying between the middle and outer coats of the artery, from which it differed markedly in structure, being mainly composed in the vicinity of the anastomosis of dense fibrous tissue containing many elongated nuclei. In addition it received fibers from the inner portion of the outer arterial coat; a few scattered elastic fibers were also present.

The ligatures 0.16 mm. in diameter and three in number were all situated between the middle and the outer coats. One situated in the end of the venous segment near the anastomosis and cut transversely was surrounded by elastic fibers, which were continuous with the fibers of the fibrous layer of the middle coat of the vein. Another cut in a similar manner and situated in the end of the artery was surrounded by fibers similar to the ones surrounding the first and were continuous with the fibers of the muscular layer of the artery. The other ligature was apparently cut through a knot. It was situated between the middle and outer arterial coats and was embedded in the base of the wedge of granular material occupying that situation. It may be that the wide separation of the coats of the vessel and the presence of such a large amount of granular material at this point was partially due to the presence of this knot, as it was quite bulky.

From the microscopic examination it is possible to conclude: (1) The wall of the artery is only slightly altered; (2) the wall of the vein has become enormously thickened, the muscular and fibrous layers of the middle coat and the inner layer of the outer coat being principally involved; (3) no evidence of weakening or breaking down of the wall is observed; and (4) the ligatures are enveloped in a dense coat of fibrous tissue.

CONCLUSIONS. 1. A venous segment interposed between the cut ends of an artery quickly undergoes anatomical changes.

2. From macroscopic and microscopic standpoints the vein has a strong tendency to assume the character of an artery.

3. From a physiological standpoint it performs the arterial functions.

ESSENTIAL PENTOSURIA IN TWO BROTHERS.¹

BY THEODORE C. JANEWAY, M.D.,

ATTENDING PHYSICIAN TO ST. LUKE'S AND THE CITY HOSPITALS, NEW YORK CITY.

HISTORICAL. Salkowski and Jastrowitz, in 1892, first observed the excretion in the urine of an optically inactive sugar which did not ferment with yeast. This they identified as a pentose,² by the melting point of its osazon. In 1895, Blumenthal reported two more cases from Salkowski's laboratory. Since that time additional observations have brought the number of indubitable instances of this metabolic anomaly to seventeen, all but a few of which are from Salkowski's laboratory, or the first medical clinic in Berlin. One true case and several questionable ones have come from Italy, and a careful study of two patients from Norway; but no single instance has yet been reported in the British, French, or American literature. The condition is evidently rare, but may frequently have escaped detection or publication.³

Apart from its theoretical interest, pentosuria is of importance clinically because of its confusion with diabetes in almost every recorded case—an error which, once the existence of pentosuria is in mind, may be easily avoided.

After a careful study of the original reports the seventeen cases reported by the following observers seem to me unquestionable: Salkowski and Jastrowitz⁴ (Case I), Blumenthal⁵ (Cases II and III), Bial⁶ (Cases IV and V), Meyer⁷ (Case VI), Luzzatto⁸ (Case VII), Blumenthal⁹ (Case VIII), Brat¹⁰ (Cases IX and X), Bendix¹¹ (Case XI), Bial¹² (Cases XII, XIII, XIV, and XV), and

¹ Read at a meeting of the Association of American Physicians, Washington, D. C., May 15 and 16, 1906.

² The pentoses are sugars containing five carbon atoms; the better known grape sugar, fruit sugar, etc., being hexoses with six. The various members of the group differ from one another in the position of attachment of the OH groups, as do dextrose, levulose, and galactose, for instance, among the hexoses. Pentoses are common in the vegetable kingdom, in fruits and stems especially. The most important ones are l-arabinose and l-xylose. In the animal body, pentoses are present in the nucleoproteids, that of the pancreas and of the liver having been identified as l-xylose.

³ One case I know has been definitely studied by a member of this Association, Prof. E. K. Dunham, though never put on record.

⁴ *Centralbl. f. d. med. Wissenschaft*, 1892, xxx, 337.

⁵ *Berl. klin. Woch.*, 1895, xxxii, 567.

⁶ *Ztschr. f. klin. Med.*, 1900, xxxix, 473.

⁷ *Berl. klin. Woch.*, 1901, xxxviii, 785.

⁸ *Festschrift f. P. Albertoni, Bologna, 1901; Beiträge z. chem. Physiol. u. Pathol.*, 1904-5, vi, 87.

⁹ *Die deutsche Klinik*, 1902, No. 71-72, Amer. edit., *Modern Clinical Medicine, Diseases of Metabolism*, p. 262.

¹⁰ *Ztschr. f. klin. Med.*, 1902, xlvii, 499.

¹¹ *Münch. med. Woch.*, 1903, liii, 1551.

¹² *Berl. klin. Woch.*, 1904, xli, 552.

Klercker¹ (Cases XVI and XVII). In addition, von Jaksch² refers to a case he has had under observation for some time and is about to publish. This with Dunham's unpublished case and my two would make twenty-one cases in all.³

The cases of Reale and of Colombini, included by Bendix in his monograph, but with some doubts, I do not think can be admitted as chronic pentosuria, on account of the disappearance of the pentose after a short time. In Reale's case, also, the differentiation from glycuronic acid was not carefully made. Neuberg mentions d'Amato as publishing a case, but this was an example of pentosuria accompanying severe pancreatic diabetes.

In all the above cases except Luzzatto's the pentose was optically inactive; and in one, Neuberg succeeded in isolating the r-arbinose. Luzzatto, in his second paper, described the osazon he obtained as dextrorotary to the same degree as that of l-arabinose. Whether this is a unique case, with the excretion of l-arabinose alone, or possibly an alimentary pentosuria accompanying the chronic r-arabinose excretion, as has been described, does not seem to me proved.

PERSONAL OBSERVATIONS. The two cases observed by me are a reproduction of those already on record and I report them in brief as showing the usual clinical history.⁴

CASE I.—Male, aged twenty-eight years, married, a salesman. Born in Germany. His father died, aged sixty-two years, of angina pectoris; mother aged thirty-two years, of some liver trouble. The mother suffered from migraine. Three brothers and five sisters are living and healthy, except that one brother has a little "sugar" also.⁵

The patient had tuberculous glands of the neck operated on eight years ago, and catarrhal jaundice at the age of eighteen years, but no other illness. He has never been robust, and has suffered from headaches as long as he can remember. During the period of observation he had a sharp attack of renal colic. He was refused life insurance five months ago because of "sugar," and has been on a rather restricted diet since. Sugar had been found, however, as long as a year ago.

Physical examination was wholly negative.

Urine, 1050 c.c., in twenty-four hours; specific gravity, 1028; highly acid, without albumin, but reducing Fehling's solution, and giving a doubtful bubble in the fermentation tube prepared without

¹ Nord. med. Arch., 1905, xxxviii, abt. ii, S. 1, 55.

² Zentralbl. f. innere Med., 1906, xxvii, 145.

Since this paper was read, Blum (*Ztschr. f. klin. Med.*, 1906, lix, 224) has reported two additional cases without family tendency; Kaplan (*New York Med. Jour.*, 1906, lxxxiv, 233) has reported a case of intermittent pentosuria and glycosuria, which, though not true chronic pentosuria, is of much interest; and Johnstone (*Edin. Med. Jour.*, 1906, lxii, 138) has reported a case from von Jaksch's clinic.

³ I wish to thank my father, Dr. E. G. Janeway, and the family physician, Dr. H. A. Bernstein, for the privilege of studying these patients.

⁴ I have not been able to examine the remaining brothers and sisters. One uncle has no pentosuria.

special care as to air bubbles in the urine. This was on a diet containing considerable bread, milk, and fruit.

He was put on a proteid-fat diet, plus 120 grams of toast, to test his tolerance, and the trace of sugar remained unchanged, even after he developed a slight Gerhardt reaction. After a short time the lack of relation between his reported sugar excretion and his diet was so evident that I suspected the presence of pentose, and looked for it. The orcin test was strongly positive, as was the phloroglucin test. Nylander's reagent gave a light-brown color. The reduction of Fehling's solution did not occur for a few minutes after boiling, and then the change of color was sudden to a greenish yellow throughout.

During almost daily observations for two months no positive evidence of fermentation was ever obtained, no rotation of polarized light, and the pentose color and spectroscopy reactions were always positive. One hundred grams of dextrose at a single dose failed to produce the slightest glycosuria, as evidenced by fermentation or the polariscope. The phenylhydrazin test was always positive. The osazon was obtained from a large quantity of urine, concentrated *in vacuo*, and its melting point found to be 154 to 158° C. For assistance with this I have to thank Prof. John A. Mandel. The nitrogen content of the osazon has not yet been determined, as all the substance is being used by Prof. Mandel and Dr. Levene, in the attempt to isolate the pure arabinose.

The daily amount of reducing substances excreted was estimated as dextrose, by titration with Pavey's solution—which seems to me rather preferable to Knapp's solution, used by others for this purpose—and found to vary between 2.46 and 4.2 grams, calculated as dextrose.

A study of the effect of diet was made, of a rather unsatisfactory character, because the patient could not control quantities as well as might be desired, but with careful collection of all urine over a long period. The average of the daily estimations by the above method showed the following:

	Average sugar excretion as grams dextrose.
Purin-free diet, 3 days (milk, eggs, rice, toast)	2.56
Ordinary mixed diet, 7 days	3.3
High purin diet, 5 days (much sweetbread, liver and kidney)	3.6
Purin-free diet, 2 days	2.88
Ordinary mixed diet, 2 days	3.1

CASE II.—Brother of Case I, aged twenty-seven years, single, manufacturer. Born in Germany. The patient had meningitis severely at the age of three years; pneumonia as a child, and again three years ago; operations on the nose during the last three years. Has never applied for life insurance. In January of this year he began having headaches like his brother. The urine was examined and sugar found. Restricted his diet for a time only. Correction

of astigmatism cured his headaches. Complained of some palpitation and nervousness, and that he was not very strong.

Physical examination was wholly negative. His urine showed the presence of a non-fermentable optically inactive sugar, giving a typical orcin reaction. The melting point of the osazon was 160 to 162° C. The patient came under observation only a couple of weeks ago, but the amount of urine and of reducing substance, as dextrose, is exactly similar to the other case, from 2.46 grams on a purin-free diet to 3.95 grams on a diet high in nucleins.

I hope to be able in the future to undertake a more complete study of these cases, as well as an investigation of the remaining members of their family.

PRESENT STATE OF OUR KNOWLEDGE OF PENTOSURIA. Three different types of pentosuria have so far been observed, the distinctions between them being important. Alimentary pentosuria, analogous in every way to alimentary glycosuria, occurs whenever large amounts of vegetables or fruits containing pentosanes are eaten, though it is usually very slight. Von Jaksch (*loc. cit.*) has just called attention to its frequency in patients who take much of the pure fruit juices—apple, for instance. Alimentary pentosuria is distinguished, apart from its transitory character and evident cause, by the polariscopic reaction, no optically inactive vegetable pentose being known.

A second group contains those rare cases of severe diabetes in which the inability to burn carbohydrates extends to the pentoses as well as the hexatomic sugars. I have not personally observed this, though on the watch for it during the past winter, but authentic cases like d'Amato's are on record. This group, also, has no real relation to essential pentosuria.

The third group, chronic pentosuria, occurring without reference to the pentoses of the food, and persisting unchanged for years, is a very difficult problem in intermediary metabolism. The definite facts thus far ascertained are as follows:

The sugar excreted is the optically inactive r-arabinose (with the possible exception of Luzzatto's Case VII). This is the only known occurrence of an optically inactive sugar anywhere in nature. It, therefore, cannot be derived from the vegetable pentoses, nor from the l-xylose of the food nucleins. Blumenthal¹ says that he and Bial have found the arabinose in the blood.

The amount excreted is small and fairly uniform in the various cases, from 0.2 to 0.6 per cent., as a rule. Blumenthal's Case VIII, with 1 per cent., is the highest on record. The urine quantity in no case has been excessive. The specific gravity is somewhat increased, and the acidity usually marked.

In a few cases small amounts of glucose have appeared from time

¹ Deutsche Klinik, *loc. cit.*

to time (Cases I and XVI, possibly IX), but tests with 100 grams of glucose have shown no diminished tolerance for this sugar. In my first case I am unable absolutely to exclude a trace of glucose, in the period before the discovery of pentose, but I consider its presence highly improbable.

The power of burning dextrose has been normal in all the cases examined (Cases IV, XI, XVI, XIX, and my Case I). The tolerance for other carbohydrates has also been tested by Bial¹ and by Klercker,² who found levulose, galactose, and, the former, l-arabinose, as fully utilized.

He also found no increase in pentosuria after feeding 500 grams of thymus. Further experiments with inactive galactose are necessary, in the light of Neuberg's theory.

The nuclear metabolism has not been increased, as measured by the excretion of purin bodies and of phosphorus,³ hence⁴ the source of the pentose cannot be an abnormal nuclear destruction, as was to be expected from other considerations.

Klercker, as well as I, have found a diminished pentose excretion on a milk or purin-free diet; Klercker obtained his lowest figures during hunger. He also found a certain parallelism between total nitrogen and pentose in the urine. Blumenthal also states that he and Meyer have found that a meat diet increased the nervous disturbances in these patients, and a milk diet was particularly advantageous. These facts would seem to point toward some relation between the abnormal production of r-arabinose and the activity of metabolic processes.

A family predisposition seems well-marked (Cases IX and X, XI, XII and XIII, XVI and XVII, and my two). The nineteen cases represent only fourteen families, and this question of heredity was not studied with most of the other patients.

The relation to morphine and cocaine addiction, at first supposed, because of Salkowski's original case, has not been substantiated. Reale's and Colombini's patients were of this character, but were not true chronic pentosurics.

In many of the cases neurasthenic symptoms and neuralgic pains have been prominent. Others have been perfectly well when once freed from the restrictions of a diabetic regimen.

Concerning the real nature of the malady, we can only say that it is an anomaly in the intermediary metabolism, rather analogous to cystinuria and alkaptonuria than to diabetes.

DIAGNOSIS. The recognition of new cases of pentosuria must depend largely upon clinicians, who should be conversant with the simple tests necessary to establish the diagnosis as a probability.

¹ Verhandl. d. XIX Cong. f. in. Med., 1901, p. 413.

² Nord. med. Arch., 1905, xxxviii, Abt. II, p. 1 and 55.

³ Die Pentosuria, Stuttgart, 1903, p. 49.

⁴ Loc. cit.

Any urine which reduces Fehling's solution in an atypical way, the color remaining unchanged for a minute or so after boiling and then suddenly turning a greenish yellow or muddy orange throughout, should be subjected to further tests. If it yield good crystals with the ordinary phenylhydrazin test, does not ferment with yeast, and is optically inactive, pentose is probably present.

The orcin test, with the precautions urged by Brat,¹ should be used, whenever there is any suspicion. To 3 c.c. of urine add 5 c.c. of concentrated HCl, specific gravity 1.19, and a knife-point-full of orcin. With a thermometer in the test-tube, heat on a water-bath at 90 to 95° C for two or three minutes. In the presence of pentose a green precipitate will form, which should be taken up with amyl alcohol and examined spectroscopically, an absorption band in the orange and contiguous red being typical of pentose. Too prolonged heating may split up the conjugate glycuronic acids, which will then give the reaction, and are the only possible sources of confusion. (Menthol and turpentine glycuronic acids break up spontaneously, but may be recognized at once by their odor.) Heating over the direct flame may fail to produce the typical reaction when pentose is present; but, if the other method is impossible, may be resorted to for ruling out pentosuria. I have also found that very concentrated urines often give a gummy red precipitate, which obscures the green, and these should be diluted one-half.

When the orcin test is positive^{2 3} the absolute proof must be sought in the preparation of the osazon, with phenylhydrazin. If the melting point of this be found about 156 to 160° C., and its N. content about 17.07 per cent., then the diagnosis is beyond question. This must, of course, be left to a competent chemist.

CLINICAL SIGNIFICANCE OF ESSENTIAL PENTOSURIA. No patient with pentosuria has been under surveillance a sufficient length of time to speak with absolute certainty of its course or prognosis. No bad results have yet been noted, though Blumenthal considers it possible that the increase in circulating sugar may conduce to arteriosclerosis, as in diabetes. There is, of course, no loss of an important foodstuff, as in the latter disease, and the prognosis is certainly better than in the mildest diabetes. In life insurance, I think this should be the attitude toward such cases. It is in life insurance examining that the condition should be most often found, and it is a gross injustice to class these people with diabetics.

The only treatment consists in carefully explaining to the patient the difference between his ailment and diabetes, and the removal of any previous dietetic restrictions he may have been subjected to.

¹ Ztschr. f. klin. Med., 1902, xlvii, p. 199.

² For the differential diagnosis of the various carbohydrates of the urine, see F. C. Wood, *Chemical and Microscopic Diagnosis*, 1905, New York, p. 548, or F. Blumenthal, *Pathologie des Harnes*, 1903, p. 112.

³ Otori, Ztschr. f. Heilkunde, 1901, xxv, p. 12, found that he could detect the presence of arabinose by this method in dilution as low as 0.05 per cent.

LITERATURE.

The full literature of the subject with excellent critical reviews may be found in the following publications:

Bendix, E. *Die Pentosurie*, Stuttgart, 1903.

Neuberg, Carl. *Die Physiologie der Pentosen und Glukuronsäure* *Ergeb. d. Physiol.*, 1904, iii, p. 373.

Klercker, K. O. *Studien über die Pentosurie*, *Nord. med. Arch.*, 1905, xxxviii, Abt. ii, p. 1 and 55.

The best clinical article is that on Pentosuria by F. Blumenthal, *Modern Clinical Medicine, Diseases of Metabolism*, 1906, p. 262.

THE VALUE OF MASSIVE DOSES OF THE SALICYLATES IN THE DIAGNOSIS AND TREATMENT OF ACUTE ARTICULAR RHEUMATISM.

BY THOMAS WOOD CLARKE, M.D.,

RESIDENT PHYSICIAN, THE LAKESIDE HOSPITAL, CLEVELAND, OHIO.

FOR the last six years, in the treatment of acute articular rheumatism at the Lakeside Hospital, the tendency has been to a progressive increase in the dosage of sodium salicylate employed. Beginning with ten grains every two hours or fifteen grains every four hours, the amount used has been increased to ten grains, fifteen grains, or even twenty grains hourly in the endeavor to secure the drug effect as promptly as possible. This massive salicylate dosage has seemingly been of such value in the prompt and sure control of symptoms that an analysis of the hospital cases so treated has been undertaken in a critical review of the question. In the review it has seemed only fair, in order, if possible, to learn the exact effect of these large doses, to exclude certain classes of cases. For this reason, all patients who showed an acute complication on admission to the hospital and those in whom, on admission, the temperature was normal, probably due to medication at their homes, have been omitted. Children below twelve years of age have also been excluded on account of the difficulty of classifying these according to dosage. All other cases are included in the analysis.

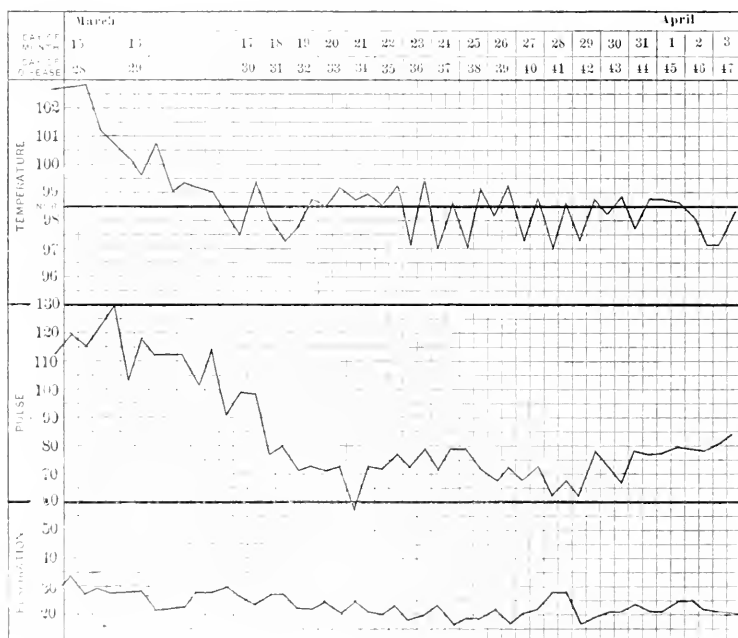
These exclusions leave seventy-four cases of adults admitted with joints acutely inflamed and temperatures elevated. The discussion of the effects of the large doses of the salicylate, an administration of 240 grains, or more, in the twenty-four hours being considered a large dose, will be divided into two heads, therapeutic and diagnostic.

THERAPEUTIC EFFECTS. The routine method of treatment has consisted of giving the sodium salicylate every hour, if the patient was awake, in doses varying from 10 to 20 grains, until the toxic symptoms appeared, the attendants being alert to recognize the appearance of deafness and tinnitus, as an index of full drug effect; the salicylate was then stopped, to be resumed when the symptoms

disappeared, and then given in doses of 10 or 20 grains every two to four hours, stopping again with each recurrence of toxic symptoms. The amount of salicylate required to produce symptoms of its full effect has varied from 75 to 360 grains, the average in the entire series being 200 grains. These massive doses are borne well, as a rule, without nausea, vomiting, or depression, and the coincident relief of pain makes what discomforts there are seem trivial.

Fever. The effect of this sudden saturation with the drug is a very rapid fall of the temperature to the normal. Chart 1 of a patient who became toxic on 165 grains shows this fall very typically.

CHART 1



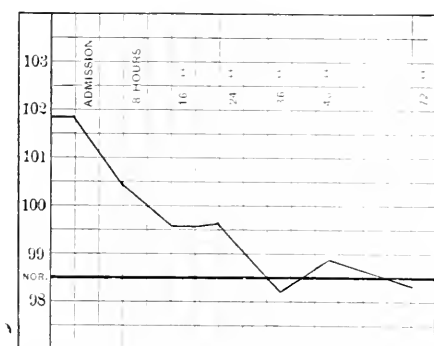
Showing the influence of large doses of salicylates on the temperature, pulse, and respiration of a patient with acute articular rheumatism.

Coming in with a fever of 102.8° F. at 8 p.m., in twenty-four hours the temperature was 99°, and in thirty-six hours it was subnormal. That this is not exceptional, and is, in fact, what is expected under this treatment, is shown by Chart 2, which is a composite of the temperature of the first three days of the entire series of seventy-four patients. A study of the number of days of fever after the patient's admission shows that the shortest period was one day and the longest eleven days, with an average fever of 3.8 days. The average febrile period of the illness, including the time before treatment was begun, while the patient was still at his home, was thirteen days.

Pain. The relief from pain is most striking. A patient brought in during the afternoon, in such acute agony that a touch of the bedclothes or a jar of the bed causes a cry of anguish, and who may have required a dose of morphine to allow the nurse to remove his clothing, frequently greets the physician with a smile the following morning at the ward visit, and often moves his joints himself to show his improvement. The pain in some patients is entirely absent on the second day and never returns. Our analysis of the seventy-four cases shows that by the fourth day the average patient is free of discomfort. The longest period of pain has been nine days.

Swelling. The swelling rapidly subsides, sometimes before the pain, and sometimes persists in a mild degree for a day or two longer. The records upon this point have not been as full as might be desired, but of cases in which the note was made, the swelling disappeared, on the average, on the third day after admission. In

CHART 2



A composite of the temperature of the first three days of seventy-four patients with acute articular rheumatism, showing the influence of large doses of salicylate.

but four of the seventy-four patients has any joint become involved after the treatment was begun.

Heart. Owing to the general belief in the danger to the heart of using the salicylate in large doses this organ has been watched with especial care, and it has been gratifying to see in how few of our cases this fear has been justified. Cardiac complications instead of being increased in frequency by this method of treatment seem to be lessened. The prevalence of acute endocarditis occurring during rheumatism is given by various authors at different rates. W. Gilman Thompson¹ gives acute endocarditis as occurring in 25 per cent. of the cases; Anders² in from 25 to 30 per cent. Polton³ quotes the following authors: Bamberger, 20 per cent.; Wunderlich,

¹ Amer. Syst. Prac. Med., vol. iv, p. 958.

² Practice of Medicine, Phila., 1898, 2d ed. p. 206.

³ Jour. Amer. Med. Assoc., 1903, xl, p. 83.

9 per cent.; Bellevue Hospital reports, 33 per cent.; Anders, 40 per cent.; and West, 61.3 per cent. A study of McCrae's recent articles¹ shows that of 153 patients in whom the heart was clear on admission, 48 at some time developed some sign of cardiac complication, a percentage of 31, which just agrees with the average of those above mentioned. In our series of 74 patients, 46 had apparently normal hearts on admission to the hospital, and of these, only 6 developed any sign of an endocardial complication. In 4 of these the murmur persisted at discharge, and in 2 it was only temporary and disappeared under observation. This record of 13 per cent. of endocardial complications certainly compares favorably with general experience. There was 1 case of pericarditis in our series of 74 cases. During this period there were several other cases of rheumatic pericarditis in the hospital, but as they were admitted with the complication, they could not be included in this series.

In most of our cases the alkalis in the form of potassium acetate and citrate were given. In eighteen of the cases, however, it was omitted and dependence was put upon the salicylate alone. Though the numbers are too small for conclusions to be drawn, it is of sufficient interest to note in passing that all the six cases of cardiac complications occurred in the patients who received alkalis, and none in the fourteen patients with normal hearts on admission, who were on the salicylate alone.

The depression of the heart, so often spoken of in connection with salicylate treatment, has not been evident in our cases. The pulse usually drops within three days to from 70 to 80, as is shown in Chart 1, and remains at that level, strong and regular during convalescence. In one case only in which there was no evident endocarditis has the pulse weakened. In this case it rose to 120 and remained elevated for three days, when it again returned to the normal rate and no further trouble was experienced.

Danger. In the use of such large doses of sodium salicylate there is a certain element of danger. With proper care and attention, however, this is not great. The toxic symptoms must be watched for carefully, and their appearance indicates the immediate stopping of the drug. Again, too, as some persons show no toxic symptoms until they have taken enormous quantities, it would be well to put a limit upon the amount to be given. In the only fatal case in our series the patient took, without any signs of poisoning, 580 grains, at the rate of 20 grains an hour. At this point we discontinued the drug and for two days he did well; then he suddenly became wildly delirious and developed retraction of the head, Kernig's sign, and a high temperature. A lumbar puncture brought out clear fluid under pressure, which showed nothing

¹ Jour. Amer. Med. Assoc., 1903, xl, p. 211; American Medicine, 1903, vi, p. 221.

abnormal on examination. The condition continued and progressed until the patient died on the tenth day. The autopsy showed marked oedema of the brain, or serous meningitis, and vegetative endocarditis. We are loth to attribute this man's death to salicylate poisoning, and think it was more likely a case of rheumatic meningitis. The possibility however, must be considered of the drug having caused the symptoms.

The main objection to the use of the massive doses is the difficulty in keeping the patients at rest after the first three days. Feeling comfortable, and, as they express it, cured, most of the unintelligent public ward patients can see no reason for remaining in bed, and clamor to go to their homes to work, and it is often hard or impossible to keep them on their backs for the three weeks after the last symptoms have disappeared, a procedure which has seemed advisable.

DIAGNOSIS. More and more attention is being paid each year to the diagnosis of the various forms of arthritis, particularly to the differentiation of the real cases of rheumatic fever from other infectious forms of arthritis, and especially from the acute stage of arthritis deformans, the latter of particular interest since McCrae's¹ article on the subject appeared in 1904. With this point in view the series of cases here reported has been watched, and the impression has steadily gained strength that in using the salicylates in these large doses, they are of value as a diagnostic test. The amount of the drug which a patient will take before becoming toxic is the first point to be considered, and it has constantly been observed that whereas the true rheumatic can tolerate from 150 to 300 grains before symptoms appear, persons suffering from other forms of arthritis become toxic on much smaller doses, the gonococcic cases for example averaging in our series 131 grains. The second point is the relief from symptoms. In true rheumatism the fever, pain, and swelling are gone in from two to three days. In the other forms of arthritis, while the antipyretic effect of the drug may bring the temperature to normal, and while the depressed sensorium may not appreciate the pain so acutely, the swelling does not go down and, as soon as the toxic effects of the salicylate wear off, the pain returns with all its old vigor. The result of this has been that, on this service, any patient having fever and pain at the end of forty-eight hours is considered as a doubtful case of rheumatism and most careful search is instituted for the underlying cause of the arthritis. A *resume* of the cases of gonorrheal arthritis to which the massive doses were given, during recent years, shows by contrast to the above an average run of fever of twenty-one days after admission, of pain of twenty-six days, and of swelling of thirty-one days. These numbers should really be larger

¹ Jour. Amer. Med. Assoc., 1904, xlii, pp. 8, 94, and 161.

than this shows, as in many cases the date used is that on which the patient was transferred to the surgeons before improvement had begun. An attempt to review the cases of typhoid and other infectious arthritis, of arthritis deformans, tuberculous joints, and gout showed so few cases treated with massive doses of salicylates that they could not be used in comparison.

I was especially impressed with this point in analyzing the histories for this report by finding one case which differed most materially from the others. The history, taken in 1901, was of a man admitted with acute polyarthritis, who, although he received 15 grains of the sodium salicylate every hour did not respond to treatment in the uniform manner of the other cases of the series. It was a typical case of rheumatism and was so diagnosed at the time. On re-reading the history to find an explanation for the failure of response to the drug, the patient's name being noticed for the first time; it was recognized as that of a patient at that time, four years later, in the ward with the typical chronic spondylitis and dactylitis of arthritis deformans.

CONCLUSIONS. 1. Sodium salicylate can and should be given in much larger doses than are generally used.

2. Given in massive doses it reduces the fever, relieves the pain and swelling, and shortens the course of the disease.

3. It is not injurious to the heart, and appears by quickly cutting off the disease to offer some protection to that organ.

4. The patient's tolerance to the drug and the rapid cessation of symptoms form valuable therapeutic tests for the diagnosis of acute articular rheumatism.

For permission to use the cases from the medical service, I wish to thank Drs. Hunter Powell, John H. Lowman, Henry Upson, and Edward F. Cushing, visiting physicians to the Hospital and especially Dr. Cushing, for many suggestions and ideas, here used, and for oversight and criticism of the work during preparation.

Since writing this article my attention has been called to the Harveian Lecture of Dr. Lees,¹ who has made a careful study of the use of massive doses of salicylates in rheumatism.

¹ The Treatment of Acute Visceral Inflammations, London, 1904.

A NEW BLOOD FILARIA OF MAN: *FILARIA PHILIPPINENSIS*.¹

BY P. M. ASHBURN, M.D.,

CAPTAIN, MEDICAL DEPARTMENT, U. S. ARMY, MANILA, P. I.,

AND

CHARLES F. CRAIG, M.D.,

FIRST LIEUTENANT, MEDICAL DEPARTMENT, U. S. ARMY, MANILA, P. I.

(CONSTITUTING THE U. S. ARMY BOARD FOR THE STUDY OF TROPICAL DISEASES IN THE PHILIPPINE ISLANDS.)

INTRODUCTION. *Filaria philippinensis* is a small sheathed filaria found in the blood of a Visayan prisoner in Bilibid prison, Manila, at all hours of the day and night, but always in small numbers. At the time of our observations it seemed rather more numerous at night, though even then, it was, at times, hard to find. The greatest number we have found in one slide was seven. Once we examined seventeen spreads and found but one parasite. This was one day at noon. On another occasion a slide taken at noon showed five organisms.

There is a history that the worm formerly occurred in the peripheral blood only in the daytime, when it was found in great numbers, and the hospital records show a diagnosis of *Filaria diurna*. As, according to Manson and other authorities, the periodicity of *Filaria diurna* never changes, and as this worm is now found in the peripheral blood throughout the twenty-four hours, it is obvious that the diagnosis of *Filaria diurna* was erroneous.

We are of the opinion that this filaria represents a new species for the reasons given in the detailed description of the worm, because of its lack of periodicity, and because of the rarity of filariasis in the Philippine Islands, where all the conditions would seem favorable to the rapid spread of infection were the parasite any of the previously known varieties.

While other cases have doubtless been observed in these Islands we are unable to find in the literature more than ten reported cases (all described as *F. nocturna* or *F. diurna*), although many observers have carefully sought for filaria and thousands of routine blood examinations have been and are being made throughout the Islands.

Although in the reported cases the filariae were diagnosed as *F. nocturna* or *F. diurna*, there is nothing in the descriptions given which excludes the possibility that the observers might have been dealing with *F. philippinensis*, and that the latter is the only filaria indigenous to the Philippine Islands.

DESCRIPTION OF *FILARIA PHILIPPINENSIS*, NOV. SP. (ASHBURN AND CRAIG). Only the embryonic stage of this filaria has been observed.

¹ Published by permission of the Surgeon-General, U. S. Army. Received for publication June 23, 1906.

Length. The average length of the fresh specimen is 0.32 mm. Satisfactory measurements are very hard to obtain, as the worm, when alive, is constantly in motion, and we cannot be sure that the dead worm, even immediately after death, is of the same length as the living one. There is considerable variation in the length of the living worm, as is shown by the following measurements of twenty specimens.

No. 1	0.325 mm.	No. 11	0.322 mm.
No. 2	0.33 "	No. 12	0.292 "
No. 3	0.30 "	No. 13	0.315 "
No. 4	0.315 "	No. 14	0.310 "
No. 5	0.335 "	No. 15	0.325 "
No. 6	0.34 "	No. 16	0.300 "
No. 7	0.326 "	No. 17	0.315 "
No. 8	0.315 "	No. 18	0.310 "
No. 9	0.307 "	No. 19	0.335 "
No. 10	0.307 "	No. 20	0.330 "

Stained Specimens. In specimens stained in dilute carbol-fuchsin, after dissolving the hemoglobin of the red cells in distilled water, the worm appears slightly shortened, the average length being 0.296 mm. We have found this stain the most efficient of any we have tried, as it colors the nuclear bodies and brings out the structure of the filaria. Hemotoxylin is almost useless in staining this filaria and Wright's stain greatly shrinks the organism.

Diameter. The average diameter of the worm is 0.0065 mm., a trifle less than the diameter of a red blood cell.

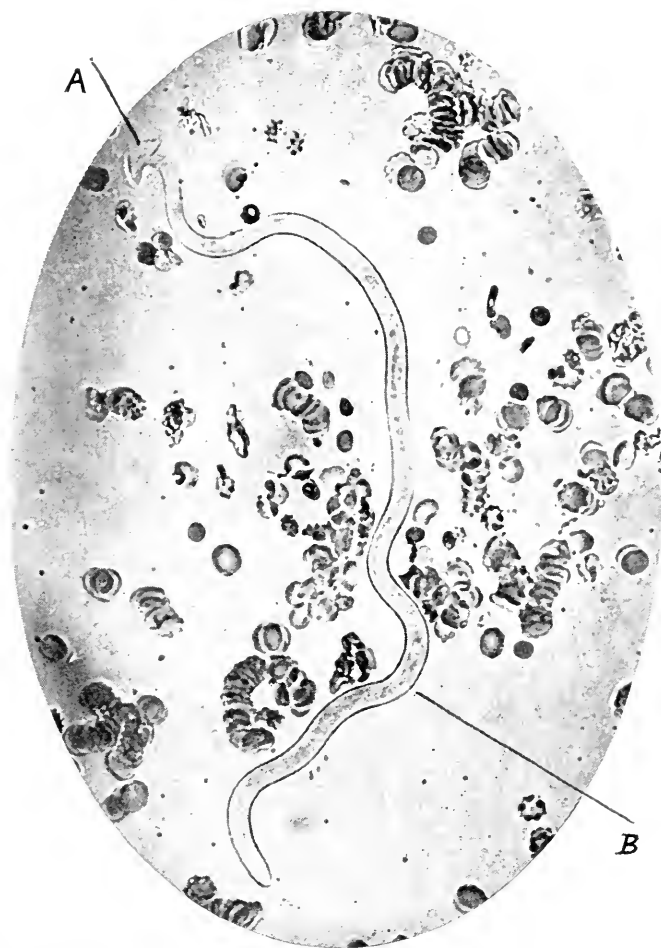
Sheath. This filaria is enclosed within a very delicate, and, in the living specimen, tightly fitting sheath. In the living worm this sheath is very closely applied to the body and can be seen only as a fine thread, resembling a flagellum, at the ends (Fig. 1, A), and never distended or flat, as is that of *F. nocturna* or *F. diurna*. The thread-like extremities of the sheath are quite as delicate as the flagellum of a trypanosome, and are lashed rapidly about as the worm moves. The filaria cannot be seen to move backward or forward within the sheath. Under certain conditions to be described later, the sheath may be observed to be separate from the body and distended, especially at the tail end. In stained specimens the sheath is sometimes observed faintly colored and flattened like a band, considerably longer and broader than the worm. The majority of stained specimens, however, do not show the sheath.

Head. The anterior extremity consists of a smooth, hemispherical head, on which is mounted, and into which retracts, a very minute spicule. This spicule when magnified 1800 diameters looks about the size of a very small but oblong eosinophilic granule.

Surrounding this smooth hemispherical head, and when closed, covering it, when retracted, exposing it, is a prepuce, which apparently consists of a musculo-cutaneous layer very finely serrated at its margin; we have found it impossible to determine the number of serrations or lips on account of their minute size. The prepuce

is constantly drawn back and forth, covering and uncovering the head and spicule, but its motion is not always synchronous with that of the spicule, being usually slower. The appearances described can only be made out as the motion of the filaria ceases, and never in the stained specimens.

FIG. 1



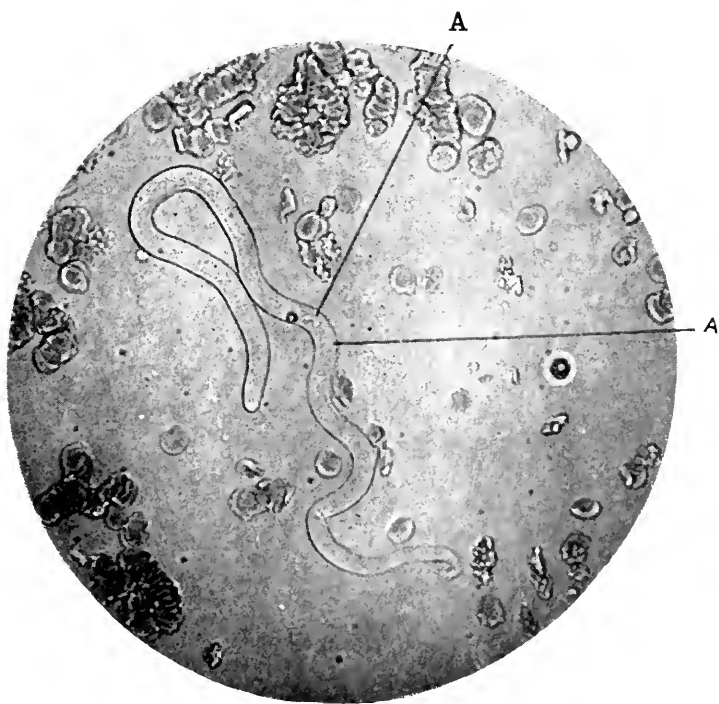
Filaria philippinensis (living organism), showing the anterior V-spot at *B* and the flagellum-like end of the sheath at *A*. (Zeiss objective DD, projection ocular No. 4)

Body. The body is long, graceful, and sinuous, consisting of an outer or musculocutaneous coat, and an inner portion or body cavity. Under high magnification and in some photomicrographs, a delicate but distinct radial striation can be seen in the musculocutaneous layer (Fig. 4). In the very fresh specimens the inner portion or body cavity is for the greater part clear and highly refrac-

tile, though it contains a few scattered granules and the following constant viscera:

Anterior V-spot. In the posterior portion of the anterior third of the worm is situated the anterior V-spot (Fig. 1, *B*). This is a bright, refractile, triangular spot, placed at one side of the worm and opening by its apex upon the surface. It is situated in the majority of cases about 0.105 mm. from the margin of the head. With high powers the apex can be seen opening between the striations of the musculocutaneous coat, evidently piercing it. This

FIG. 2



Filaria philippinensis (living organism), showing the central or "spiral" viscus at *A*. The entire spiral is not in focus, only the top of the loops being visible. (Zeiss objective DD, projection ocular, No. 4.)

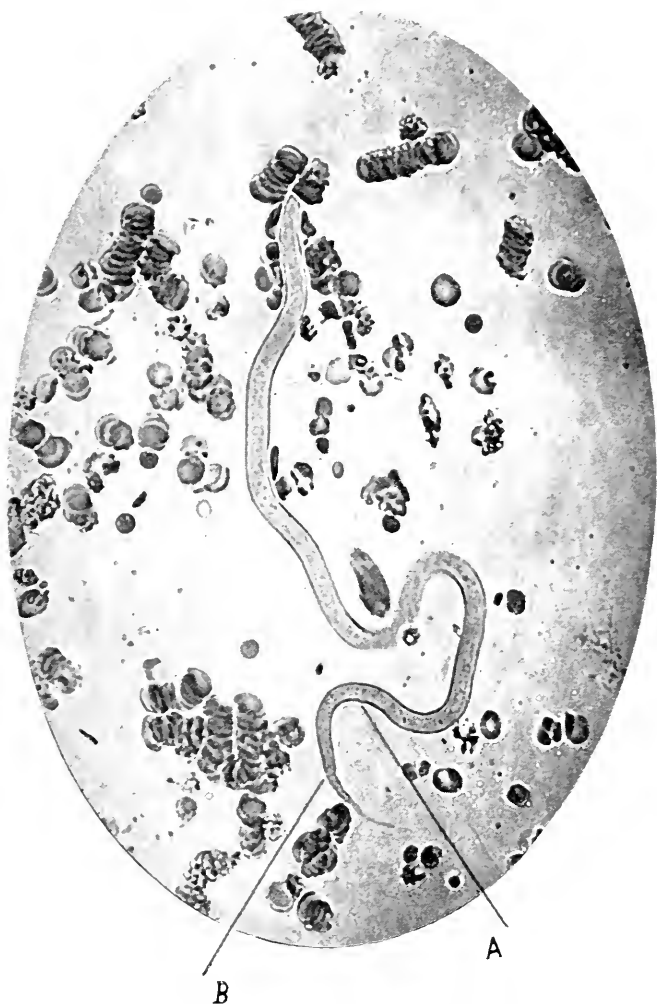
spot has not been observed to show contractility. In stained specimens the anterior V-spot cannot be seen.

Central Viscus. In the central third of the body of the filaria, usually towards the posterior end of it, but at times pushed forward, is the central viscus, which for *F. nocturna* and *diurna* is described by Manson as "a granular mass," but which in this filaria is clearly and easily seen to be a convoluted or spiral tube or cylinder, resembling much a vine tendril, and showing five or six spiral turns (Fig. 2, *A*). (Note: In the photomicrograph only the portion

of the spiral turns in focus are shown.) Its tubal diameter is about 1 micron, its spiral diameter about 2 microns or a little more.

The spiral organ is only observed in fresh and undegenerating specimens of the filaria.

FIG. 3



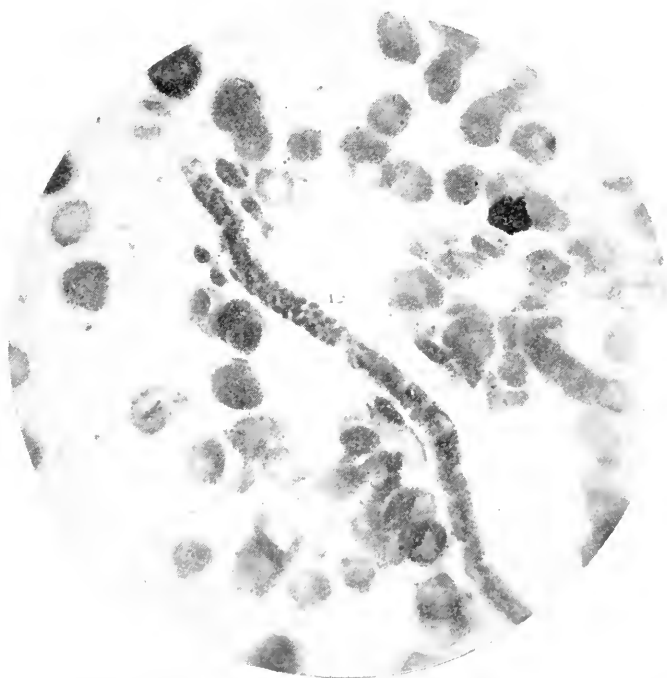
Filaria philippinensis (living organism), showing the anal papilla at A, and the sudden attenuation of the tail at B. (Zeiss objective DD, projection ocular No. 4.)

Posterior V-spot and Papilla. At about the middle of the posterior of the worm are situated the posterior V-spot and the papilla. The V-spot cannot always be seen as easily as the anterior V-spot, but in the vast majority of cases it can. It is placed with the apex opening upon the surface, breaking or piercing the musculocutan-

eous coat. In addition to the appearances presented by the anterior V-spot, this one marks the site of a distinct papilla which bulges beyond the general body line (Fig. 3, 14). (Note: The papilla is in focus, but not the V-spot.) This point may represent the anus or cloaca of the adult worm; at any rate it is a point of minor resistance in the embryo, as shown by the following phenomena which may at times be observed:

If spreads of fresh blood be made, and not "ringed," a negative pressure will sometimes develop under the cover-glass, as the blood dries. In such instances the worm, if it be kept in the field of a

FIG. 4



Filaria philippinensis (stained with diluted carbol-fuchsin), showing the anterior "gap" in the column of stained cells and the striation of the musculo-cutaneous coat. (Zeiss $\frac{1}{12}$ inch oil immersion, projection ocular No. 4.)

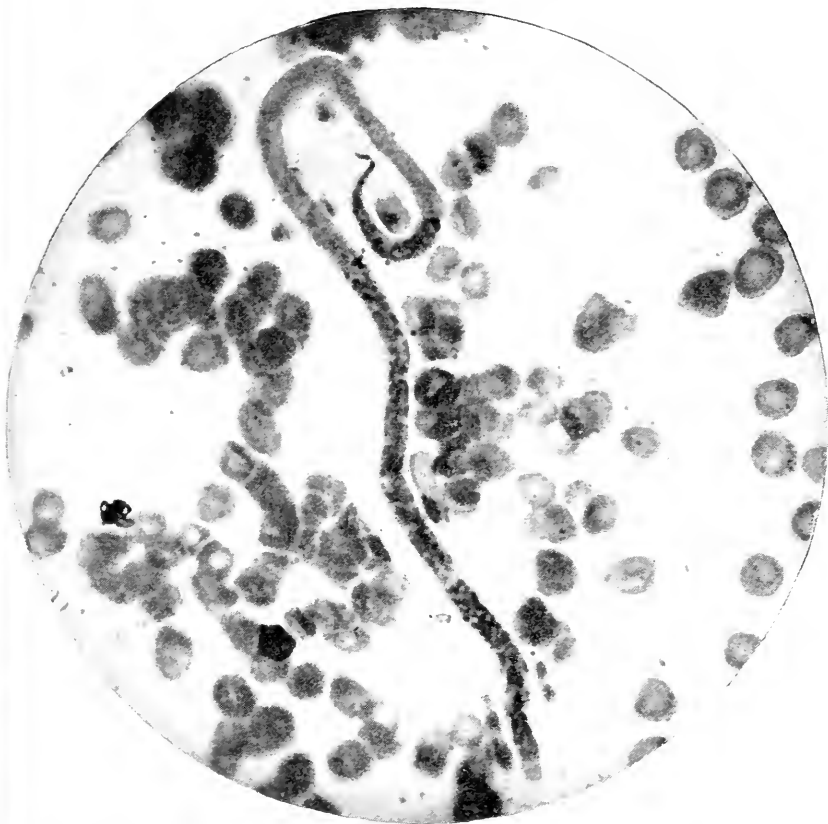
one-twelfth inch objective, will appear too small and the anal papilla will become prominent. Soon it will evert and the V-spot will be inverted and upon the outside of the body, though still attached. Finally, the V-ruptures and fluid, or gas, or both, containing granules, flows out of the body of the filaria and between it and the sheath, distending the latter and separating it from the body. Degenerative changes then follow rapidly, the central viscus, the V-spot, and later, the striations of the musculo-cutaneous layer disappear, and the body cavity becomes filled with vacuoles and granular material.

In stained specimens the posterior V-spot is not visible.

Tail. Midway between the posterior V-spot and the tip, the tail suddenly becomes attenuated to three-fourths its former diameter, making a distinct offset on each side. From this offset it diminishes progressively and uniformly to a very fine point (Fig. 3, B).

The relative position of the embryonic anus and the apparently less vital character of the small portion of the tail beyond the atten-

FIG. 5



Filaria philippinensis (stained with diluted carbol-fuchsin), showing the column of stained cells, the anterior "gap," and the sudden attenuation of the tail. (Zeiss objective DD, projection ocular No. 4.)

uation, suggests that during development of the worm this portion of the tail dies or is sloughed off at the point of diminution.

Stained Specimens. In stained specimens a column of deeply colored spots, round or oval in shape, is observed running the entire length of the worm, but broken, here and there, by unstained areas, which vary in situation in individual specimens. The stained spots are apparently the nuclei of the body cells. There is a clear,

unstained space between the column of nuclei and the outer border of the filaria, on each side.

In view of the fact that Daniels, Dutton, Annett, and others, state that the position of unstained "gaps" in the column of stained spots in filaria are of diagnostic value in the differentiation of species, we have carefully stained many specimens of our filaria, but have not found that in this organism much reliance can be placed upon the situation of the "gaps," since they vary markedly in position in individual filaria.

The only interruption or "gap" in the column of stained granules in *Filaria philippinensis* which can be said to be at all constant is the "gap" situated anteriorly, at a point about 20 per cent. of the total length of the worm from the margin of the head (Figs. 4 and 5). Many specimens do not show this "gap," however, and upon reference to the following table it will be seen that there is much variation in the situation of this "gap" in individual worms. The table also shows the variation in length of the worms in fuchsin stained specimens.

No.	Length of stained worm.	Anterior "gap" in percentage of total length.
1	0.325 mm.	23
2	0.29 "	19
3	0.28 "	23
4	0.285 "	22
5	0.315 "	22
6	0.31 "	21
7	0.315 "	17
8	0.33 "	22
9	0.31 "	19
10	0.30 "	20
11	0.29 "	22
12	0.285 "	18
13	0.255 "	20
14	0.25 "	18
15	0.32 "	Anterior "gap" not apparent
16	0.30 "	
17	0.315 "	
18	0.295 "	
19	0.30 "	
20	0.30 "	
21	0.30 "	
22	0.285 "	
23	0.28 "	
24	0.30 "	
25	0.285 "	

In a few stained specimens a loose arrangement of the stained nuclei may be observed in the region of the spiral viscous, and a break near the posterior V-spot, but neither of these is of any diagnostic importance, as they occur comparatively seldom, and other worms show a similar arrangement of the stained nuclei in very diverse situations.

A very constant arrangement of the stained nuclei in the tail is in the form of a single row of rod-shaped or slightly oval spots, which become smaller and smaller as the tip of the tail is approached.

Motility. This filaria is very active in its movements, wriggling about so rapidly that it cannot be well studied for some hours after the blood is drawn. The motion, in most instances, is not progressive, but at times it is markedly so. Motion continues in "ringed" preparations and at room temperature, when the thermometer shows a maximum of 98° F., and a minimum of 80° F., for about thirty-six hours in hardy individuals.

Our attention has been called by Dr. Martin, the Government photographer, to the fact that our filaria is more resistant to the action of the arc light, during the taking of photomicrographs, than is *Filaria nocturna*.

Degenerative Forms. Very marked degenerative changes occur in this filaria and no safe conclusions can be drawn regarding its morphology after degeneration has once begun. The anterior V-spot, the spiral viscus, and the posterior V-spot and papilla disappear, and the entire organism becomes filled with granular material and vacuoles. The morphology of this organism can only be well studied in the fresh specimen.

Pathogenicity. Having observed but one case of infection with this filaria, we are not, at present, prepared to say what symptoms may be produced by it. This one patient has had several attacks of chyluria, though not during the period of our observations. He has no markedly enlarged glands, no lymphatic varices, no elephantiasis that we can detect. His skin is dry and rough and his general appearance one of rather poor nutrition, but these conditions may be quite as readily accounted for by his imprisonment as by the filariasis.

CONCLUSION. In conclusion, the following table is appended, giving the chief differential points in the structure of the previously described filariæ and *Filaria philippinensis*.

Name	Length	Breadth	Sheath	Head	Tail	Ant. V-spot	Viscus	Post. V-spot	Motility	Periodicity
<i>F. nocturna</i> .	mm. 0.30	mm. 0.0075	Present Loose	6 lips	Pointed	Present	Granular mass	Present	Lashing not progressive	Nocturnal
<i>F. diurna</i>	0.30	0.0075	Present Loose	6 lips	Pointed	Present	Granular mass	Present	Lashing not progressive	Diurnal
<i>F. persians.</i>	0.20-0.23	0.0045	Absent	Papillated	Blunt	Negative	Negative	Negative	Lashing and progressive	None
<i>F. demarquai.</i>	0.20	0.005	Absent	Spine	Pointed	Present	?	?	Progressive	None
<i>F. ozzardi.</i>	0.21	0.005	Absent	?	Pointed	?	?	?	Progressive?	None
<i>F. philippinensis.</i>	0.32	0.0065	Present Tight	Serrat. retractile band	Pointed abruptly attenu'd.	Present	A spiral tube or cylinder	Present Also a papilla	Lashing and progressive	None

SPLENOMEDULLARY PSEUDOLEUKEMIA, WITH SECONDARY MYELOPHTHISIC ANEMIA.

BY CHARLES E. SIMON, M.D.,

PROFESSOR OF CLINICAL DIAGNOSIS IN THE BALTIMORE MEDICAL COLLEGE, BALTIMORE,
MARYLAND.

THE patient is a male, aged seventy-nine years, who was admitted to the surgical service of the Maryland General Hospital, March 16, 1906, with a burn of the left hand. He had had the usual diseases of childhood, and typhoid fever at an early age. Otherwise his health had always been good and he had been able to work at his trade as a painter up to Christmas, 1905. He admits that for about a year he has readily become short of breath and that his eyelids have been puffed; his strength, however, has remained unimpaired. He denies venereal disease. Of his thirteen children, all but three have died in infancy. He has never had any lead palsy, but speaks of attacks of colic, which have occurred now and then. There is no malarial history. His digestive functions are good and there has been no material loss of flesh.

The patient is a man of small stature, rather younger looking than his age would suggest. He is fairly well nourished, with good abdominal panniculus, but quite pale, without any lemon tint. Examination of the chest reveals nothing abnormal beyond a blowing systolic murmur heard over the entire precordium, but not propagated beyond the anterior axillary line; the heart dulness is within normal limits. The lymph glands are nowhere enlarged. The abdomen is moderately full. The spleen extends well into the left iliac fossa and forward to within two finger breadths of the umbilicus; the notch is readily felt. The organ is somewhat movable, smooth and fairly hard. The liver is palpable at the right costal border. Percussion of the bones elicits no tenderness. The urine contains a moderate number of granular casts and a trace of albumin.

Examination of the blood showed a very interesting condition. The red cells numbered 2,195,000; the hemoglobin was 25 per cent; the color index was 0.58. While there was a certain amount of variation in size and form of the red cells, there was no manifest tendency to macrocytosis or oval form; true poikilocytes were not numerous. The cells were pale and showed no evidence of polychromasia, while granule cells were present in fair numbers. Nucleated red cells were not found. The leukocytes numbered 22,000. The differential count showed: lymphocytes, 92.6 per cent (of which 2 per cent. large lymphocytes); large mononuclears, 1.6 per cent.; polynuclear neutrophils, 5.6 per cent.; mast cells, 0.6 per cent.

During the patient's stay in the hospital two other examinations

were made. The findings, so far as the red cells go, were essentially the same as at the time of the first examination, and there were no nucleated red cells. The leukocytes were 10,900 on April 10, and somewhat lower on April 19. The differential counts follow:

April 10th. Lymphocytes, 81.8 per cent.; large mononuclears, 3.0 per cent.; polynuclear neutrophils, 15.2 per cent.; eosinophiles, 0.0 per cent.; mast cells, 0.0 per cent.; myelocytes, 0.0 per cent.

April 19th. Lymphocytes, 94.5 per cent.; large mononuclears, 1.0 per cent.; polynuclear neutrophils, 3.0 per cent.; eosinophiles, 1.0 per cent.; mast cells, 0.5 per cent.; myelocytes, 0.0 per cent.

The patient remained at the hospital for observation until April 19th, and died suddenly about a week after returning to his home. Unfortunately no autopsy was obtained.

The clinical diagnosis of the case presented a number of interesting questions. My first impression was that we were dealing with an example of the type of leukanemia described by Leube, in which the blood picture of pernicious anemia is associated with that of leukemia. While in the majority of the recorded cases the leukocytic formula has shown a predominance of granulocytes, lymphocytosis has been noted in others (Körmöczy, Luce, Parkes Weber). In all the recorded cases, however, normoblasts and megaloblasts have been observed, while in my case no nucleated red cells could be demonstrated. I have pointed out, moreover, that the color index was low and that there was no well-defined tendency toward macrocytosis or oval form, as we see it in typical cases of pernicious anemia. It, therefore, did not seem warrantable to classify the case as one of leukanemia, in accordance with the original definition of the term by Leube.

Splenic anemia, in the sense in which Osler uses the term, seemed excluded. There had been no hematemesis at any time and no pigmentation of the skin. The corpuscular anemia was much more marked than is usual in splenic anemia; there was no leukopenia and the leukocytic formula was markedly altered; while in splenic anemia the differential count is not characteristic.

A simple chronic lymphatic leukemia was out of the question in view of the absence of any enlargement of the lymph glands, and against the diagnosis of acute myelogenic lymphoid leukemia, there was the duration of the disease, the practical absence of any clinical symptoms, the splenomegaly, and the predominance of the small lymphocyte in the blood.

Under the circumstances I have ventured to offer the pathologico-anatomical diagnosis expressed in the heading of the paper, as furnishing the most probable explanation of the clinical findings. I am thus inclined to view the splenomegaly as a primary splenic pseudoleukemia and the anemia as the expression of a myelophthisis with substitution of the erythroblastic by lymphadenoid tissue.

INFECTIONS OF THE BILIARY TRACT, WITH SPECIAL REFERENCE TO LATENT (OR MASKED) AND TYPHOID INFECTIONS.¹

By A. O. J. KELLY, M.D.,

ASSOCIATE IN MEDICINE IN THE UNIVERSITY OF PENNSYLVANIA AND ASSISTANT PHYSICIAN
TO THE UNIVERSITY HOSPITAL; PROFESSOR OF THE THEORY AND PRACTICE OF MEDICINE IN
THE UNIVERSITY OF VERMONT; PROFESSOR OF PATHOLOGY IN THE WOMAN'S MEDICAL
COLLEGE OF PENNSYLVANIA; PATHOLOGIST TO THE GERMAN HOSPITAL,
AND PHYSICIAN TO ST. AGNES' HOSPITAL, PHILADELPHIA.

THAT infections of the biliary tract are by no means uncommon has long been recognized. The gross and quite obvious manifestations of such infections—suppurative cholangitis, suppurative, phlegmonous, and gangrenous cholecystitis, certain forms of abscess of the liver, etc.—were well recognized and quite accurately described by our forefathers. That these disorders, however, by no means comprise the totality of biliary infections has been demonstrated only during recent years, and even now the full import of other less obvious infections is not as widely known nor as keenly appreciated as is desirable. There are much more subtle infections of the biliary tract—ill-understood, frequently overlooked, and commonly misinterpreted: infections that often give rise to no symptoms, at least no noteworthy symptoms, for many years, if at all; infections diverse in their pathological lesions, variable in their sequels, and often complex and aberrant in their clinical manifestations; indeed, of many the symptomatology has not yet been completely worked out.

The observations to which I invite your attention are based primarily upon a statistical study of the clinical and other phenomena of 216 patients operated upon by Dr. John B. Deaver at the German Hospital, Philadelphia, during the last six years (1900 to 1905 inclusive).² My personal work has comprised a study of the gall-bladders removed by Dr. Deaver; of the pathological lesions at the necropsy in some of the fatal cases and in other cases (from the medical as well as the surgical wards) in which operation was not done; of the pathological lesions at the operation on some of the patients;³ and a bacteriological study begun at the time of operation in seventy of the cases, and at the necropsy in a few of the fatal cases. I had thought to add certain details of my clinical experience gained elsewhere, but I have finally determined,

¹ Part I of the Mütter Lecture of the College of Physicians of Philadelphia, delivered December 1, 1905.

² It is with much pleasure that I here record my indebtedness to Dr. Deaver for his many courtesies in connection with the study. Not only has he afforded me opportunities to witness many of his operations, but he has also generously permitted me to make a statistical study of his case-histories. I am also indebted to Dr. James R. Freeland, one of the resident physicians at the German Hospital, for assistance in compiling the statistics.

³ The living as contrasted with the dead pathology, as Dr. Deaver delights to call it.

in this communication, to deal only with the German Hospital material.

The somewhat restricted aspects of the broader subject of infections of the biliary tract that I have elected to discuss with you may be divided more or less artificially into two parts: the one comprising the more immediate, the second the more remote consequences of biliary infection. In many cases, however, the one fades almost imperceptibly into the other, and no sharp line of demarcation can be drawn between them. In this, Part I, I shall ask your attention especially to the pathways of infections of the biliary tract and to latent (or masked) and typhoid infections; in Part II, I shall discuss certain remote consequences of biliary infection, notably cholelithiasis, calculous cholecystitis, and adhesions of the upper abdomen, and I shall also direct your attention to the general principles of treatment and the indications for surgical intervention.

THE INFECTIOUS AGENTS.

The bacteriology of infections of the biliary tract has been studied by a large number of investigators—postmortem, at operation, and experimentally. Although considerable interest attaches to postmortem studies, the results are frequently vitiated by more or less obvious factors, and they cannot be relied upon implicitly unless the examinations are undertaken within a very short time after death. The conditions at operation, however, are quite different and the results much more trustworthy—although in subsiding or long-standing infections the primary infective agent may not be recovered, since it may have died out or have become overgrown by secondary invaders.

Although I have made some study of the bacteriology of the biliary tract at necropsies, these have been comparatively few and non-systematic, and they were undertaken largely because of special interest in individual, particularly typhoid fever, patients. At the German Hospital, however, we have studied the bacteriology of the biliary tract of seventy of the patients¹ operated upon by Dr. Deaver. The results are as follows:

	Cases.	Per cent.
<i>Bacillus coli communis</i> was found in	23	32.8
<i>Bacillus typhosus</i> was found in	7	10.0
<i>Staphylococcus pyogenes aureus</i> was found in	2	2.9
<i>Streptococcus pyogenes</i> was found in	1	1.4
<i>Staphylococcus pyogenes albus</i> was found in	1	1.4
<i>Bacillus coli</i> and <i>Staphylococcus aureus</i> were found in	2	2.9
No bacteria were found in	34	48.6

¹ Fifty of these cases have already been reported by Dr. G. P. Muller, assistant pathologist to the German Hospital: *The Pathology of Cholecystitis*, Brooklyn Med. Journ., 1905, xix, 11

In general these results do not differ materially from those obtained by other observers, although the variety of bacteria is not as great as that of all other observers combined. Other bacteria isolated from the biliary tract comprise the cholera bacillus, *Bacillus subtilis*, *Bacillus capsulatus aërogenes*, *leptothrix*, etc. Biliary infections complicating pneumonia and influenza suggest the possibility of the pneumococcus and the influenza bacillus respectively being the etiological agent (general blood infection or a local infection from the duodenum), but as far as I know these organisms have not yet been isolated from the local lesions. In addition to the aforementioned bacteria I am inclined to attach some etiological importance to anaërobic bacteria—which abound in the intestine. I have long believed that these organisms play a not inconspicuous part in the etiology of appendicitis, and I am quite prepared to believe the same of infections of the biliary tract. A most suggestive study of this entire question has recently been published by Lippmann.¹

THE PATHWAYS OF INFECTION.

The pathways whereby the biliary tract may become infected are several: (1) The diverticulum of Vater and the common bile duct; (2) the portal circulation; (3) the systemic circulation; (4) the lymphatic circulation; and (5) directly through the wall of the gall-bladder or the gall ducts from the peritoneum.

1. *Infection from the duodenum by way of the diverticulum of Vater and the common bile duct* has long been looked upon as at once the most likely and the most common source of biliary infections, but whether with good reason remains to be decided. Its possibility cannot be denied, its probability may be conceded, but the exact factors concerned in its mechanism have not yet been determined definitely. In this connection we have to bear in mind that although the frequency of *Bacillus coli communis* and of *Bacillus typhosus* in infections of the biliary tract suggests an intestinal source, these bacteria find a direct pathway from the intestine to the liver by way of the portal circulation. Furthermore, as a number of observers have pointed out, whereas the jejunum and the ileum always contain many bacteria, the duodenum when free from food is often bacteria-free; certainly, in health its bacterial-content is small and it does not contain the bacteria often found in cholangitis, cholecystitis, etc. It is quite conceivable, however, indeed it is quite likely, that in conditions of disease of the upper intestine when bacteria are present in the duodenum the biliary tract may become infected by way of the diverticulum of Vater;

¹ *Le microbisme biliaire normal et pathologique*, Paris, 1904.

doubtless many of the cases of so-called catarrhal jaundice following gastroduodenitis arise in this fashion. But there are at least two important factors opposing a ready ascending infection of the biliary tract: The one, the action of the sphincter of the diverticulum, which has been estimated by Oggi¹ as exerting a force equal to a pressure within the common bile duct of 700 millimeters of water; the second, the influence of the free flow of bile. Indeed, it is doubtful whether infection of the biliary tract ever takes place by way of the diverticulum of Vater in the absence of stasis of the bile.

One of the most important, if not the most important, factor in preventing such infection is the free flow, that is the regular periodic expulsion, of the bile—the free flow of the bile rather than the bile itself, since we now know, contrary to former opinions, that the bile is a quite favorable medium for the growth of bacteria.

Assuming infection by way of the diverticulum of Vater, we must credit the invading bacteria with some degree of intelligence—else why in their onward march do they deviate to the left rather than to the right when they encounter the fork in the diverticulum? As far as we know the pancreatic duct is by no means as frequently infected as the biliary passages. The influence of differences in pressure in the two ducts cannot be of commanding importance, since in this event the secretion of the one would frequently be forced into the other. Should this be the common source of biliary infection we must also assume that in conditions of ordinary infection the pancreas and the liver are quite capable of dealing with the invading bacteria, and that it is only because the gall-bladder has no analogue in the pancreatic duct that the biliary tract is so much more commonly the seat of infection. In this connection we may contrast the infrequency of intrahepatic lithiasis with the infrequency of pancreatic lithiasis: possibly many of the causative factors of both are quite alike. We must also explain why bacteria, innocuous or comparatively innocuous in the intestine, become mischievous immediately they pass the portal of the diverticulum. Possibly the conditions are analogous to those encountered in the vermiform appendix where defective drainage plays such an important etiological role. Finally, it is important to emphasize the fact that were typhoid cholecystitis, for instance, an ascending infection micro-organisms other than the typhoid bacillus, such as *Bacillus coli communis*, streptococci, staphylococci, etc., would probably frequently be found in association with the typhoid bacillus, and that the regularity with which the typhoid bacillus is recovered in pure culture from the gall-bladder in typhoid fever renders it unlikely that the infection is an ascending one.

¹ Quoted by Naunyn, *Zur Naturgeschichte der Gallensteine und zur Cholelithiasis*, Grenzgeb. der Med. und Chir., 1905, xiv, 537.

In favor of the view that infection may occur by way of the diverticulum of Vater, I may mention that bacteria have been found in the diverticulum under apparently normal conditions; that Lippmann¹ recently has isolated bacteria from the middle and even the upper third of the apparently normal common duct—in numbers decreasing upward; that in the presence of gallstones, bacteria are not infrequently more numerous in the lower end of the common bile duct than elsewhere in the biliary tract; that as we might expect *a priori* motile bacteria, such as *Bacillus coli communis*, *Bacillus typhosus*, etc., are much more commonly the invaders than non-motile organisms, such as streptococci, staphylococci, pneumococci, etc.; that experimentally infection has been found to occur with readiness when the flow of the bile has been impeded—in which relation the early experimental work of Gilbert and Girode² and others merits attention; and that, finally, I believe significant deductions may be drawn from the recently published and very interesting experiments of Bond³ on ascending currents in mucous glands and gland ducts. Bond seems to have proved that by some means or other, and under certain conditions, particles of an insoluble substance, such as indigo, inserted into the orifice of a mucous canal or duct are conveyed along the mucous channel in a direction reverse to that taken by the contents of the tube, or by the secretion or excretion of the glands along such ducts—that is, for example, from the duodenum to the gall-bladder, from the urethra to the urinary bladder, etc. Bond believes that this phenomenon is not due to physical agency alone, such as capillary attraction, since it is absent in the non-living tube; and that the transference of the particles in empty tubes and ducts is one, and that there are several other reasons for regarding the mucus that coats the walls of the tube or duct as the vehicle in which the particles are carried. The essential factors seem to be a living tube the walls of which are partially, if not wholly, in apposition and lined with a mucous secretion. Further observation is said to be necessary to ascertain whether a reverse current—a sort of backwater—is present in all mucous channels, or whether it only exists where the normal outgoing current of secretion or excretion is interfered with. Such a back current is probably present to a certain extent normally, although it is much increased by any agency, such as a fistula, which starts a flow of mucus from the other end of the canal.

The application of the foregoing observations to the possibility and the phenomena of ascending infections of the biliary tracts must be quite obvious. Thus, while we cannot deny that infection of

¹ Loc. cit.

² Contribution à l'étude bactériologique des voies biliaires, Comp. rend. Soc. Biol., 1890, ii, 739.

³ Ascending Currents in Mucous Glands and Gland Ducts, Brit. Med. Jour., 1905, ii, 232.

the biliary passages may and probably does occur in some cases by way of the diverticulum of Vater, we are forced to the conclusion (1) that certain ill-understood factors exercise in the process a more or less unknown part, and (2) that in the past we have unquestionably overestimated the importance and the significance of this source of infection.

2. *Infection by way of the portal circulation* is doubtless a common source of biliary infection, although it was for a long time overlooked. Definite experimental proof that the bile may become infected from the circulation was furnished years ago by Blachstein¹ and Welch,² and their results have since been amply confirmed and amplified by a number of investigators, notably Sherrington,³ Desoubry and Porcher,⁴ Nocard,⁵ Fütterer,⁶ Adami,⁷ Ford,⁸ Wrzosek,⁹ Lartigau,¹⁰ Doerr,¹¹ and others. Though there have been a few dissenters, such as Carmichael,¹² the recent very accurate studies leave no room for doubt that bacteria transported to the liver by the portal circulation may be found in the bile. Although one may well concede, indeed maintain, that under normal circumstances bacteria carried to the liver by the portal circulation are there destroyed by the bactericidal properties of the liver cells, he must admit a limit to such bactericidal properties and that when overcome bacteria may pass over into the biliary passages. Among others, Lartigau's work is especially conclusive. Having tied the common bile duct in a number of animals he fed the animals *Bacillus pyocyaneus*, and was subsequently able to recover this organism, sometimes alone, sometimes associated with *Bacillus coli communis*, from the gall-bladder of almost one-half the animals. Adami having shown that, under apparently normal conditions, bacteria may be found in the deeper layers of the intestine, in the portal circulation, and in the liver, suggests that they invade the

¹ Intravenous Inoculation of Rabbits with the *Bacillus coli communis* and the *Bacillus typhi abdominalis*, Johns Hopkins Hosp. Bull., 1891, ii, 96.

² Additional Note Concerning the Intravenous Inoculation of the *Bacillus typhi abdominalis*, Johns Hopkins Hosp. Bull., 1891, ii, 121.

³ Experiments on the Escape of Bacteria with the Secretions, Jour. Path. and Bact., 1892-93, i, 258.

⁴ De la presence de microbes dans le chyle normal chez le chien, Compt. rend. Soc. Biol., 1895, ii, 101.

⁵ Influence des repas sur la penetration des microbes dans le sang, Sem. méd., 1895, xv, 63.

⁶ Wie bald gelangen Bakterien welche in die Portalvene eingedrungen sind in den grossen Kreislauf und wann beginnt ihre Ausscheidung durch die Leber und die Niere, Berl. klin. Woch., 1899, xxxvi, 58.

⁷ On Latent Infection and Subinfection, Jour. Amer. Med. Assoc., 1899, xxxiii, 1509, 1572.

⁸ Bacteriology of Healthy Organs, Trans. Assoc. Amer. Phys., 1900, xv, 389.

⁹ Experimentelle Beiträge zur Lehre von dem latenten Mikrobismus, Virchow's Archiv, 1904, clxxviii, 82.

¹⁰ The Relation of Bacteria to the Development of Gallstones, California State Jour. of Med., 1906, iv, 17.

¹¹ Experimentelle Untersuchungen über das Fortwuchern von Typhusbacillen in der Gallenblase, Centrabl. für Bakt., 1905, xxxix, 624; Wien. klin. Woch., 1905, xviii, 884.

¹² The Effect of Injection of Micro-organisms into the Portal System on the Sterility of the Bile in the Gall-bladder, Jour. Path. and Bact., 1902-03, viii, 276.

portal circulation through the aid of the leukocytes—which are especially active during digestion, carrying foodstuffs, foreign matters, bacteria, etc., between the epithelial cells to the lymphatic radicles and the portal venules. Ordinarily most of the bacteria are destroyed, probably in large part through the bactericidal property of the normal living intestinal mucosa, as maintained by Rolly and Liebermeister,¹ in part also by the leukocytes, the lymph nodes, and the endothelium of the liver; sometimes, however, they pass through the liver and gain the bile; in other cases, by way of the thoracic duct, as maintained by Wrzosek and others, they invade the general circulation, and, as well pointed out by Ford, may be found in the liver, kidneys, etc., of apparently normal animals. This is the latent infection of Adami and certain French and German writers. Recently, Nicholls² has described what he designates a simple method of demonstrating the presence of bacteria in the mesentery of normal animals—a method based upon histological procedures, and which, although suggestive, lacks the trustworthiness accorded to cultural methods.

3. *Infection by way of the systemic circulation*, although possibly not an exceedingly common source of infection of the biliary tract, should not be entirely ignored. Its importance as a possible source of infection has been enhanced since we have ascertained the frequency, in fact almost the regularity, of bacteremia in the great majority of infectious processes—typhoid fever, pneumococcic and pyococcic infections, etc.; and experimental proof that the biliary passages may become thus infected was furnished, as already mentioned, years ago by Welch and Blackstein, and quite recently by Doerr. Doerr found that micro-organisms injected into the general circulation of rabbits appear in the gall-bladder within a few hours, and that typhoid bacilli and colon bacilli multiply in the gall-bladder and may be recovered therefrom in pure culture even after the lapse of four months. The resulting lesions were usually catarrhal, but they might become purulent. On the contrary, organisms introduced subcutaneously or intraperitoneally did not lead to infection of the gall-bladder. The occurrence of cholecystitis and cholangitis as a complication of general infections, such as influenza, pneumonia (recently reported upon by Richardson,³ Anders,⁴ etc., and studied experimentally by Brion and Kayser),⁵ etc., also suggests the likelihood of the infection occurring by way of the general circulation; but one must concede the possibility

¹ Experimentelle Untersuchungen über die Ursachen der Abtötung von Bakterien im Dünndarm, Deut. Arch. f. klin. Med., 1905, lxxxiii, 413.

² A Simple Method of Demonstrating the Presence of Bacteria in the Mesentery of Normal Animals, Jour. Med. Research, 1904, xi, 455.

³ Acute Inflammation of the Gall-bladder, AMER. JOUR. MED. SCI., 1898, cxv, 629.

⁴ Cholecystitis as a Complication of Croupous Pneumonia, Amer. Med., 1904, ix, 431.

⁵ Künstliche Infektion der Gallenblase mit Pneumokokken nach Choledochusektion, Grenzgeb. der Med. und Chir., 1903, xii, 677.

of the local biliary infection being due to organisms other than those occasioning the primary infection, and that the complicating infection may occur by way of the portal circulation or the diverticulum of Vater. Infection by way of the hepatic artery is a descending infection and operates as does infection carried by the portal circulation—since both circulations commingle at the periphery of the liver lobules; but infected blood carried by the cystic artery may, although probably rarely, lead directly to infection of the gall-bladder without the intermediation of infected bile.

4. *Infection by way of the lymphatic circulation* has been suggested by G. P. Müller,¹ who, pointing out its likely mechanism, reports a case that he believes illustrates this manner of infection. I am inclined to agree with him, although this is probably a most infrequent source of infection.

5. *Direct injection through the wall of the gall-bladder* or of the ducts from the peritoneum has been suggested as a possibility; but excluding cases of general peritonitis in which the gall-bladder may participate secondarily in the more widespread lesions and in which the mechanism of the local infection may be quite obvious, it is doubtful if infection of the biliary tract directly from the peritoneum can occur in the absence of adhesions—in which event it is probably an infection by way of the lymphatic circulation. In this connection, however, we must also bear in mind that the adhesions themselves are an evidence of past infection, and that an obvious infection in the presence of old adhesions is much more likely the relighting of an old, latent infection, rather than a new infection transmitted directly through the walls of the gall-bladder or the gall ducts.

The pathways of biliary infection doubtless vary with the infecting agent. *Bacillus coli* infections, which must be looked upon as the most common, doubtless occur most frequently by way of the portal circulation. In most cases the liver in full functional activity is enabled to destroy or render innocuous such colon bacilli as may pass the barrier of the intestinal mucosa and be transported to it; but should the physiological activity of the liver become impaired, or should the colon bacilli become of heightened virulence, as happens in inflammatory and ulcerative processes of the intestine, bacilli of attenuated virulence may pass over into the biliary circulation and, being excreted with the bile, set up a low grade biliary catarrh. This commonly passes unnoticed by the patient, but it is one of the most important factors in the etiology of gallstones, as it is also the most important factor in the complications of gallstones. We must admit, however, that in the event of gastroduodenitis colon bacilli may infect the biliary passages by way of the diverticulum of Vater and the common duct; in this event, the lesions are likely to be more abrupt in onset and more manifest clinically.

¹ The Pathology of Cholecystitis, Brooklyn Med. Jour., 1905, xix, 11.

Typhoid infection may occur by way of the portal circulation, by way of the systemic circulation, and by way of the diverticulum of Vater. I am inclined to believe that the frequency of gall-bladder infection in typhoid fever finds one of its explanations in the three sources whereby the biliary tract may become infected—although the systemic and the portal circulations are the more important.

Pneumococcic, pyococcic, influenzal infections, etc., are doubtless in many cases general systemic infections; in some cases the infection is probably by way of the diverticulum of Vater—but the subject still requires considerable elucidation.

THE RESULTS OF BILIARY INFECTION. The results of biliary infection vary with the virulence of the infecting micro-organism and the resistance offered by the subject; they may be insidious or frank in onset, acute, subacute, or chronic in course, and slight or extremely severe in character. The frank acute cholangitis and cholecystitis are usually so obtrusive in their manifestations as scarcely to escape observation; and although they sometimes present diagnostic difficulties these are usually overcome with ease and the disease is correctly recognized. When, however, the infection is more insidious in onset and subacute or chronic in course and the infecting micro-organisms of low virulence, the resulting lesions are of such nature and the symptoms so slight or altogether absent that they are often ill-understood, misinterpreted, and referred to organs other than their real source.

Since it is manifestly impossible, even if it were desirable (which on this occasion it is not), to review in detail the manifold phenomena of infections of the biliary tract, I have elected to ask your attention to several of the most interesting aspects of the subject only; that is, latent or masked infections, of which many of the typhoid (and paratyphoid) infections serve as a type.

LATENT OR MASKED INFECTIONS.

The introduction of micro-organisms of low virulence into the biliary tract may be unattended by pathological lesions, and this is the more likely to be the case if the ducts are patent and the flow of bile unobstructed. Comparatively virulent micro-organisms also may sometimes be disposed of, if the biliary drainage is free and unimpeded, but usually serious and even fatal forms of disease are thus provoked—suppurative cholangitis and suppurative and gangrenous cholecystitis. Between the extremes of innocuousness or comparative innocuousness and quick and early disaster lie the great majority of cases of biliary infection.

As in other mucous canals, the immediate result of infection of the biliary tract is the production of a catarrh, with the usual inflammatory phenomena—œdema and congestion of the mucous mem-

brane, increased production of mucus, and desquamation of epithelium. If the biliary circulation is free and unimpeded the results of this catarrh are washed away for the most part, but on account of special local conditions (largely dynamic) they are likely to accumulate, to become accentuated, and to persist in the gall-bladder. In the event of obstruction to the free flow of bile these are all the more certain to occur. In many cases the lesions thus provoked are entirely latent or unannounced by noteworthy or unequivocal symptoms; they may pursue a short course, or they may continue for years; and they are one of the most important factors, in fact, the important factor, in the etiology of gallstones. These latent or masked infections are doubtless due to different micro-organisms in different cases, but since a large majority of them are due to the typhoid bacillus (and its brother the paratyphoid bacillus) they may be studied from the point of view of typhoid infections.

TYPHOID INFECTIONS.

Although biliary complications of typhoid fever were by no means unknown to our forefathers, having been noted even by Louis in 1838 and by Murchison in 1862, the noteworthy additions to our knowledge of the subject are of quite recent date. The early history of the development of our knowledge was well reviewed in 1897, by Mason,¹ who collected 14 cases; in 1897, by Osler;² in 1898, by Da Costa,³ who collected 58 cases; and in 1899, by Camac,⁴ who collected 115 cases. Since then the subject has been studied by a large number of investigators, and we now have comparative unanimity regarding the following points: (1) That the typhoid bacillus is regularly present in the gall-bladder, and commonly in pure culture, in practically all cases of typhoid fever—indeed, it is the one region of the body from which a pure culture of the organism is most likely to be obtained; (2) that the typhoid bacillus may persist in the gall-bladder, as well as within gallstones, weeks, months, even years, after the patient has recovered from an attack of typhoid fever; (3) that cholangitis and cholecystitis (catarrhal, suppurative, and gangrenous) are by no means infrequent complications of typhoid fever; and (4) that a history of antecedent typhoid fever may be obtained in many cholelithitic and cholecystitic subjects. Furthermore, it is important to bear in mind, as has recently been

¹ Gall-bladder Infection in Typhoid Fever, *Trans. Assoc. Amer. Phys.*, 1897, xii, 23.

² Hepatic Complications of Typhoid Fever, *Trans. Assoc. Amer. Phys.*, 1897, xii, 378.

³ Significance of Jaundice in Typhoid Fever, *AMER. JOUR. MED. SCI.*, 1898, cxvi, 1; Cases of Typhoid Cholecystitis Ending in Recovery, *ibid.*, 1899, cxviii, 138.

⁴ Cholecystitis Complicating Typhoid Fever, *AMER. JOUR. MED. SCI.*, 1899, cxvii, 275; Gall-bladder Complications of Typhoid Fever, *Johns Hopkins Hosp. Reports*, 1899-1900, viii, 339.

insisted upon by Doerr,¹ Forster and Kayser,² Brion and Kayser,³ and as is suggested also by my own studies, that many of these subjects—some apparently healthy and others ill only with a local disorder—are unconscious harborers and disseminators of the typhoid bacillus. The continuous reinfection of the intestinal tract by the frequent discharge of virulent typhoid bacilli from a chronically infected gall-bladder may be of much significance to the individual, but it is of even more significance from an epidemiological point of view—since there can be little doubt that these apparently healthy harborers of typhoid bacilli spread the infection and sometimes may even give rise to more or less extensive epidemics.

If, in some cases, the typhoid bacillus is present in the gall-bladder without exciting pathological lesions, in many cases lesions are produced; all degrees are encountered—from the mild catarrh to the severest suppurative and gangrenous processes with perforation of the gall-bladder. What I desire to emphasize, however, is the fact that in many cases the biliary infection though present is altogether latent clinically, and that although in other cases it occasions demonstrable symptoms, the true nature of these is often masked and they escape correct interpretation. First, there are cases in which during the course of typhoid fever a noteworthy enlargement of the gall-bladder occurs; but the biliary ducts being patent, and the drainage therefore sufficient, and the patient's sensibilities somewhat obtunded, there is no complaint and the disorder escapes clinical recognition—unless perchance systematic and repeated examinations of the gall-bladder region are undertaken; in this event a more or less enlarged and tender gall-bladder may be encountered. I believe that it is really surprising how frequently this occurs; shall I also say surprising how frequently it goes undetected? Second, there are cases in which a little epigastric discomfort, perhaps slight nausea, in some cases actual pain, is complained of, and examination reveals an enlarged and tender gall-bladder. I have come to regard nausea during the course of typhoid fever, when not due to other obvious cause, as quite significant of gall-bladder infection, although, of course, it may be due to other factors. Third, there are cases in which announced by the ordinary symptoms an acute cholecystitis or cholangitis develops—often severe in type. This is probably more common during or after convalescence than during the course of the infection. Such is often the severity of the symptoms in these cases that I invite a surgeon to see the patient with me: his advice is always valuable, and although the infection commonly subsides spontaneously, an operation may be called for at any time—in which event it is

¹ Loc. cit.

² Ueber das Vorkommen von Typhusbazillen in der Galle von Typhuskranken und "Typhus bazillenträgern," *Munch. med. Woch.*, 1905, lii, 1473.

³ Neuere Klinisch-bakteriologische Erfahrungen bei Typhus und Paratyphus, *Deut. Archiv. f. klin. Med.*, 1906, lxxxv, 525.

desirable that the surgeon should have had an opportunity to watch the progress of the disorder.

There are, in addition, several other aspects of typhoid infection of the biliary tract worthy of study:

RELAPSE IN TYPHOID FEVER. First of all, I must point out the significant fact, first insisted upon I believe by Musser, that in reality many of the so-called relapses in typhoid fever are by no means relapses in a restricted sense, but rather manifestations of some local infection of the body—often of the biliary tract, cholecystitis. The more attentively I study my typhoid fever patients the less inclined I am to pass by a so-called relapse as a relapse only; in fact, I feel somewhat chagrined if I am unable to put my finger upon some definite cause for the return of the fever. In many cases a gall-bladder infection will be found; in other cases, an infection of the urinary tract; in others, fecal impaction, furunculosis, osteitis, periostitis, etc., while in still other cases the increased flow of infected bile occasioned by a return to a liberal diet, or other factors, may determine what may be looked upon as a real relapse—commonly reinfection from an infected gall-bladder. But in most cases, persistent search for a definite local infection will be rewarded with success. These, especially the gall-bladder infections, have important surgical bearings, and should be attentively studied. It is true that the inflammatory phenomena frequently subside spontaneously and the indication for the surgical intervention passes away; but these infections are a fruitful source of mischief in later life—often causing gallstones, subacute and chronic cholecystitis, pericholecystic adhesions, and divers other ills that commonly are grouped with the congeries of symptoms designated “stomach trouble.”

PRIMARY TYPHOID CHOLECYSTITIS. Then I must ask your attention to the occurrence of a primary typhoid cholecystitis and cholangitis—an infection of the biliary tract without other evidence of past or present typhoid infection. My attention was directed to this subject in 1901, by Pratt,¹ who, reporting two cases, referred to three other cases in the literature (Cushing, Mitchell, and Hunner). Since then the subject has been studied by Stockton and Lytle,² Burlew,³ Stewart,⁴ Rudolph Müller,⁵ Doerr,⁶ Forster and Kayser,⁷ Blumenthal,⁸ Findlay and Buchanan,⁹ etc.

¹ Typhoid Cholecystitis, *AMER. JOUR. MED. SCI.*, 1901, cxxii, 584.

² New York State Med. Jour., 1902, ii, 232.

³ Typhoid Cholecystitis and Calculi without any Evidence of Typhoid Fever, *Medicine*, 1903, ix, 734.

⁴ Primary Typhoid Cholecystitis, *Amer. Med.*, 1904, vii, 1018.

⁵ Cholecystitis und Cholangitis als Ursache von positiver Gruber-Widalscher Reaktion bei Ikterus, *Zeit. f. Heilk., path. Anat.* Heft, 1905, xxvi, 263.

⁶ *Loc. cit.*

⁷ *Loc. cit.*

⁸ Ueber das Vorkommen von Typhus- und Paratyphusbazillen bei Erkrankungen der Gallenwege, *Münch. med. Woch.*, 1904, xxxvii.

⁹ A Case of Typhoidal Cholecystitis, *Glasgow Med. Jour.*, 1906, lxx, 177.

The typhoid bacillus¹ was isolated from the gall-bladder of 7 of Dr. Deaver's 216 patients; and from the gall-bladder of another patient operated upon in 1906.² All of these 8 patients were women. In 4 no history of previous typhoid fever, nor of concurrent typhoid fever (in the commonly accepted sense), could be obtained.

The first patient, K. H., aged forty-nine years, was admitted to the hospital June 22, 1903. The first attack of pain occurred ten years prior to admission, and the pain recurred about twice a year thereafter. Operation revealed the gall-bladder thickened and contracted, extensive adhesions between the gall-bladder, the duodenum, and the stomach, a cholecystogastric fistula, and many gallstones in the adhesions. Cholecystectomy was done, and the patient recovered.

The second patient, K. C., aged fifty-six years, was admitted to the hospital August 24, 1903. The first attack of pain occurred four years prior to admission; recurrences were frequent. Operation revealed the gall-bladder enlarged, necrotic, and ulcerated, about fifty gallstones and 150 c.c. of pale, yellowish pus in the gall-bladder, and many adhesions between the gall-bladder, the duodenum, and the stomach. Cholecystectomy was done, and the patient recovered.

The third patient, E. H., aged twenty-seven years, was admitted to the hospital March 11, 1904. The first attack of pain occurred three weeks prior to admission. Operation revealed suppurative cholecystitis, about 100 c.c. of yellowish purulent material in the gall-bladder, one gallstone obstructing the cystic duct, and adhesions between the gall-bladder, the liver, the duodenum, and the omentum. Cholecystectomy was done, and the patient recovered.

The fourth patient, A. C., aged forty-seven years, was admitted to the hospital April 27, 1904. The first attack of pain occurred two years prior to admission; recurrences were frequent. Operation revealed suppurative cholecystitis, many stones, and about 100 c.c. of bloody, yellowish, purulent fluid in the gall-bladder, and a few pericystic adhesions. Cholecystectomy was done and the patient recovered.

The fifth patient, S. W., aged fifty-six years, was admitted to the hospital June 22, 1903. Nine weeks prior to admission the patient was taken ill with what was said to have been typhoid fever—chills, fever, anorexia, headache, vomiting, etc. Four weeks later pain

¹ The following biological characteristics of an organism under investigation were looked upon as proof of its being the typhoid bacillus: An actively motile bacillus that grew well on all the ordinary laboratory media; a delicate, translucent, slightly bluish, or iridescent growth with irregular or serrated edges on agar surfaces; a whitish, almost if not quite invisible, growth on potato; no gas production in glucose, saccharose, or levulose media; no indol production; no coagulation and no (or very slight) acidulation of milk; and a positive Gruber-Widal reaction with known typhoid serum in dilutions of 1 to 50 or 1 to 100 or higher.

² This patient, of course, had not been observed at the time the Lecture was delivered, but the notes of the case are included here for obvious reasons.

in the gall-bladder region was complained of and a mass was detected. Operation revealed the gall-bladder enlarged, necrotic, ulcerated, and perforated; it contained one stone and a considerable amount of dark, purulent bile. There were many adhesions between the gall-bladder, the pylorus, the duodenum, the colon, and the omentum. Cholecystostomy with drainage was done, and the patient recovered.

The sixth patient, M. R., aged forty-two years, was admitted to the hospital January 30, 1905. She had had typhoid fever fifteen years previously. The first attack of pain occurred one month after the typhoid fever; recurrences were frequent. Operation revealed a chronic cholecystitis, twenty gallstones in the gall-bladder, one stone in the common duct, and many adhesions between the gall-bladder, the liver, the duodenum, the stomach, and the omentum. Cholecystostomy with drainage was done, and the patient recovered.

The seventh patient, J. Y., aged thirty-eight years, was ill in the German Hospital with typhoid fever from April 25 to May 30, 1905. On June 7th she had what was called indigestion. On June 22d the first definite colic occurred. On July 2d she was readmitted to the hospital. Operation revealed an enlarged gall-bladder with unusually thickened walls (up to 14 mm.), one stone and about 60 c.c. of pus in the gall-bladder, and many adhesions between the gall-bladder, the edge of the liver, and the omentum. Cholecystostomy with drainage was done and the patient recovered.

The eighth patient, P. E., aged forty years, was admitted to the Hospital July 2, 1906. She had had typhoid fever fourteen years previously, and subsequently has suffered repeatedly from "stomach trouble." The first definite gallstone colic occurred eleven days prior to admission to the hospital; there were two subsequent colics. Operation revealed the gall-bladder enlarged, thickened, and congested; its mucous membrane was completely necrotic, detached, forming a veritable cast; and there were fifty to seventy gallstones in the gall-bladder. Cholecystectomy was done and the patient recovered. On August 4, 1906 (after convalescence), the patient's blood yielded a positive Gruber-Widal reaction with the typhoid bacillus.

In addition to these eight patients from whose gall-bladders the typhoid bacillus was isolated, two other rather interesting patients were observed:

The ninth patient, C. S., a male, aged thirty-five years, was admitted to the hospital March 2, 1905. He had had his first attack of colic four years before admission; a second attack three years before admission; typhoid fever fifteen months before admission; and a third attack of colic three weeks before admission. Operation revealed an enlarged and distended gall-bladder, about 200 c.c. of clear, brownish-green bile in the gall-bladder, three gallstones in the common duct, and no adhesions. Cholecystos-

tomy with drainage was done. The patient had been jaundiced for a long time, and died of capillary oozing and cholemia. His blood serum gave a positive Gruber-Widal reaction with the typhoid bacillus, but the colon bacillus only was isolated from his gall-bladder (at the time of operation).

The tenth patient, M. O., a female, aged fifty-five years, was admitted to the hospital August 11, 1905. She had had typhoid fever seven years prior to admission. The first attack of colic occurred four years prior to admission. Operation revealed a thickened and atrophic gall-bladder, one stone in the gall-bladder, adhesions between the gall-bladder, the liver, the duodenum, and the stomach. Cholecystostomy with drainage was done, and the patient recovered. Her blood serum gave a positive Gruber-Widal reaction with the typhoid bacillus. No cultures were taken.

This primary typhoid cholecystitis is of much importance from several points of view, and heretofore has been insufficiently studied. The first four cases just cited are apparently examples of primary typhoid infection of the biliary tract; the fifth, sixth, seventh, eighth, and tenth cases are obviously examples of a local infection persisting after the general infection had subsided—acute in the fifth and seventh, chronic in the sixth, eighth, and tenth cases. In the sixth case it is not unlikely that the typhoid bacillus was harbored in the gall-bladder for fifteen years—since the first attack of colic occurred one month after an attack of typhoid fever, recurrences of the colic were frequent during the subsequent fifteen years, and the typhoid bacillus was recovered from the gall-bladder at operation. It is not improbable also that the typhoid bacillus was carried in the gall-bladder fourteen years in the eighth patient (the duration of the symptoms designated “stomach trouble”), ten years in the first patient, four years in the second, and two years in the fourth—the duration of the symptoms in the respective patients; but, of course, one cannot exclude the possibility of typhoid infection of an already infected gall-bladder. This is true also of the ninth patient, in whom it is furthermore interesting to speculate whether or not the attack of typhoid fever was precipitated by infection from a chronically infected gall-bladder. The isolation of the colon bacillus only from the gall-bladder in this patient suggests the probability of subsequent *Bacillus coli* infection of the gall-bladder.

These cases of apparently long-standing typhoid infection of the gall-bladder recall several similar observations recorded in the literature; for instance, the case reported by Ramond and Faitout,¹ in which the typhoid bacillus was recovered from the gall-bladder six years after an attack of typhoid fever; Miller's² case, after

¹ Angiocholecystite à bacille d'Eberth, *Comp. rend. Soc. Biol.*, 1896, iii, 1130.

² The Presence of *Bacillus Typhosus* in the Gall-bladder Seven Years after Typhoid Fever, *Johns Hopkins Hosp. Bull.*, 1898, ix, 95.

seven years; von Dungern's¹ case, after fourteen years; Droba's² case, after seventeen years; Hunner's³ case, after eighteen years; and Camac's⁴ case, after twenty years. These cases serve also to emphasize the epidemiological significance of these unconscious carriers of typhoid bacilli—to which I have already alluded. Doubtless bacteriological investigation of the stools of chronic cholecystitic subjects would perhaps frequently disclose the typhoid bacillus. An interesting feature of many of the typhoid infections of the biliary tract is the seriousness of the lesions—well exemplified in the cases herewith reported.

THE GRUBER-WIDAL REACTION IN CASES OF JAUNDICE. Since the earliest days of the clinical use of the Gruber-Widal reaction in the diagnosis of typhoid fever, cases of so-called catarrhal (as well as other forms of) jaundice have been observed in which the serum reaction was positive—whence at first it was not unnaturally thought that possibly jaundice vitiated the diagnostic trustworthiness of the serum reaction. However, since we have come to recognize the importance and the frequency of typhoid infection of the biliary tract, since we have learned of the occurrence of a primary typhoid cholecystitis and cholangitis, we have come also to think that these cases of jaundice are examples of typhoid infection, and that the Gruber-Widal reaction is of much importance in determining the nature of the jaundice (infection). This question has been studied attentively recently by Zupnik,⁵ Eckardt,⁶ Königstein,⁷ Libman,⁸ Zevi,⁹ Rudolph Müller,¹⁰ Ludke,¹¹ Steinberg,¹² Blumenthal,¹³ Netter and Ribadeau-Dumas,¹⁴ Brion and Kayser,¹⁵ etc.

In a number of cases of jaundice that have yielded a positive Gruber-Widal reaction the typhoid bacillus has been isolated from

¹ Ueber Cholecystitis typhosa, Münch. med. Woch., 1897, xlv, 699.

² Der Zusammenhang zwischen Typhusinfektion und Cholelithiasis, Wien. med. Woch. 1899, xii, 1141.

³ A Case of Acute Suppurative Cholecystitis with Isolation of the Bacillus Typhosus Eighteen Years after an Attack of Typhoid Fever, Johns Hopkins Hosp. Bull., 1899, x, 163.

⁴ Gall-bladder Complications of Typhoid Fever, Johns Hopkins Hosp. Reports, 1899-1900, viii, 353.

⁵ Erfahrungen über die Gruber-Widal'sche Reaktion und Autoagglutination bei Typhus abdominalis, Ztsch. f. Heil., path. Anat. Heft, 1901, xxii, 334.

⁶ Widal'sche Serumreaktion bei Weil'scher Krankheit, Münch. med. Woch., 1902, xlix, 1129.

⁷ Ueber die agglutinierende Eigenschaft der Galle und des Serums beim Ikterus, Wien. klin. Woch., 1903, xvi, 985.

⁸ Notes on the Widal Reaction, Med. News, 1904, lxxxiv, 204.

⁹ Ueber die Gruber-Widal'sche Reaktion bei Ikterus, Wien. klin. Woch., 1904, xvii, 861.

¹⁰ Loc. cit.

¹¹ Agglutination bei Autoinfektionen mit besonderer Berücksichtigung des Ikterus, Deut. Archiv. f. klin. Med., 1904, lxxxi, 34.

¹² Ueber Agglutination von Typhusbazillen durch das Blutserum Ikterischer, Münch. med. Woch., 1904, li, 469.

¹³ Ueber die Bedeutung der Gruber-Widal'schen Reaktion bei Erkrankungen der Leber und der Gallenwege, Medizinische Klinik, 1905, i, 1227 (other ref.).

¹⁴ Détails sur l'agglutination dans trente-sept cas de typhoides and paratyphoides. Compt. rend. Soc. Biol., 1905, xlix, 373. (Other articles in the same volume.)

¹⁵ Loc. cit.

the biliary tract—at operation or after death; and since it has been determined experimentally that the bile as such has little if any tendency to cause agglutination of the typhoid bacillus, it is only reasonable to look upon a positive serum reaction in cases of jaundice as evidence of typhoid infection of the biliary tract. Heretofore, for obvious reasons, we have had to be content with a diagnosis of cholecystitis and cholangitis; a noteworthy advance in our diagnosis would be the recognition of the etiological agent. When cholecystitis or cholangitis complicates pneumonia, influenza, typhoid fever, dysentery, etc., the natural inference is that the primary infective agent is the cause of the complication—an inference usually but not always borne out by the fact. When, however, the cholecystitis or cholangitis occurs independently of any manifest general infection, when other evidence of general or local infection cannot be detected, the recognition of the nature of the local biliary infection is beset with difficulties.

There can be little doubt that we have much to learn of the nature of certain ill-understood forms of jaundice—so-called febrile jaundice, infectious jaundice, Weil's disease, etc. The resemblance that many of these cases bear to typhoid fever has been frequently commented upon, and it has in fact been suggested that Weil's disease is in reality a modified form of typhoid fever. Possibly in many cases it is only typhoid infection of the biliary tract. That this may well be so is suggested by the extreme variability of the known lesions of typhoid infection of the biliary tract—from the mildest local catarrhal lesions to widespread and fatal suppurative cholecystitis, cholangitis, and multiple abscesses of the liver. Furthermore, it is interesting to bear in mind that jaundice sometimes occurs at the onset of typhoid fever, as in some cases reported by Ogilvie¹ and others, and that epidemics of so-called catarrhal jaundice are occasionally observed. Dalgeish,² for instance, has reported such an epidemic that occurred in Bloemfontein, which he says resembled in many respects the prevailing typhoid fever and was thought to be due to the typhoid bacillus.

It would be wise, therefore, in all cases of jaundice to undertake bacteriological studies of the blood and the feces; whether or not these be feasible, the Gruber-Widal reaction with the typhoid, paratyphoid, and other bacilli should not be neglected. I should be inclined to consider a positive reaction in a dilution of 1 to 50 or 1 to 100, or higher, conclusive evidence of typhoid infection, having in mind, of course, the possibility of previous typhoid fever. In some reported cases positive reactions have been obtained at much higher dilutions—1 to 1800 (Rudolph Müller) and higher.

¹ Jaundice in Typhoid Fever, Brit. Med. Jour., 1901, i, 75.

² An Epidemic of Catarrhal Jaundice Probably due to the Enteric Fever Bacillus, Lancet 1901, ii, 523.

REVIEWS.

DIE KRANKHEITEN DES VERDAUUNGSKANALS. By PAUL COHNHEIM, M.D. Berlin: S. Karger, 1905.

AMONG the many excellent treatises that have appeared recently on diseases of the stomach and intestine the present work deserves a place in the library of every practising physician. It is a practical hand-book for the diagnosis and treatment of diseases of the alimentary tract, not a reference-book for those who wish to study the pathology and the latest methods of laboratory diagnosis. The author says in his preface: "I have endeavored to show that in the great majority of cases it is possible to make an exact diagnosis by the history and the physical findings, and by that means apply a rational method of treatment without recourse to the armamentarium of a laboratory and the use of the stomach tube, which is so repulsive to most patients." The promise held out in the preface is fully redeemed in the text. Minute instructions are given in the first chapter in regard to the questions to be asked in taking the history. Each question is taken up separately and discussed at great length, the significance of the various data obtained from the patient being discussed in connection with the individual diseases. Palpation carried out by certain rules is said to yield all the information about the abdominal contents necessary for practical work. In this we cannot entirely agree with the author. Obrastzow's method is recommended for locating the greater curvature of the stomach and determining the presence of dilatation or ptosis. It consists in giving the patient two glasses of water to drink and then performing so-called percutory palpation with the tips of the fingers, the gastric area being recognized by *feeling the water* in the stomach. Inflation is thought unnecessary in ordinary cases and should be used only to determine whether a tumor is connected with the anterior wall of the stomach or is situated behind the viscus. The method in experienced hands is no doubt adequate and has the great advantage of being so much less unpleasant to the patient than inflation with a tube or by the generation of carbon dioxide. While the palpation of the liver and gall-bladder (if the latter is enlarged), of the spleen under certain conditions, and of movable kidneys is commonly practised, one may be permitted to doubt whether such organs as the cecum and appendix are accessible to palpation, as stated by the author. He says that "in a comparatively large number of cases the normal appendix can be felt as a cord-like structure

about as long as the little finger and as thick as a pencil, which can be rolled under the finger." The chapter on the examination of the stomach contents is one of the shortest in the book and contains only what is absolutely necessary for office work. Relatively more attention is devoted to the microscopic examination of the stomach contents and of the feces than in other text-books on the subject.

The classification of diseases of the stomach has been reduced to the simplest possible terms—namely, organic, constitutional, and symptomatic. Pathology is altogether ignored, and the various conditions are discussed altogether from the clinical standpoint. Those who still believe in the medical treatment of ulcer will find that subject discussed in the most systematic manner. In regard to the surgical treatment the author says: "The only conditions that call for surgical treatment in ulcer of the stomach are perforation and chronic hemorrhages; on the other hand, the surgeon is very frequently called upon to treat complications of ulcer scars and their consequences." The early diagnosis of cancer before a tumor is palpable, receives the attention which such a practical subject deserves.

"We have seen that it is comparatively easy, even in the absence of a palpable tumor, first to diagnose carcinoma of the stomach as such, and second, to determine the localization of the tumor as far as necessary for purposes of treatment; for the treatment depends altogether on the seat of the neoplasm, and a knowledge of its seat is necessary for the internist in order to determine the indications for a surgical intervention." He condemns inflation of the stomach with effervescent powder in the presence of suspected cancer of the stomach, but advises simple inflation in order to determine whether the tumor belongs to the anterior or the posterior wall of the stomach.

A similar plan is followed in that portion of the book which is devoted to diseases of the intestine. The classification again is into organic, functional, and symptomatic; parasites of the intestine and diseases of the rectum are treated in separate chapters.

The brief chapter on appendicitis is disappointing. It is devoted almost entirely to the discussion of the differential diagnosis between appendicitis and "typhlitis stercoralis," and between the three forms of appendicitis: simple or catarrhal, perforative, and gangrenous. Cohnheim evidently clings to the theory of a "stercoral typhlitis," and, true to the plan of his book, ignores the controversy on this subject which has been carried on during the past years. Possibly he thinks the question has no practical importance, as he views the differential diagnosis purely from the standpoint of treatment: stercoral typhlitis or simple inflammation of the cecum, due to fecal accumulations, and simple or catarrhal appendicitis recover under conservative medical treat-

ment; while perforative, gangrenous, and the larval, as well as the recurrent form, require operation; but he has, to say the least, given too much prominence to this disputed clinical entity, stercoral typhlitis, to the neglect of other important conditions, the differential diagnosis of which is dismissed with a mere enumeration.

The text is agreeably diversified with short clinical reports of apposite cases, and an appendix contains a table for use in diagnosing diseases of the stomach without the use of a test breakfast; a collection of diet lists; a short abstract of balneotherapy and hydrotherapy, and a "clinical A B C of the most important digestive disturbances."

The book should prove useful as a guide to teachers and students and as a hand-book to practitioners, particularly on questions of treatment.

R. M. G.

PATHOGENIC MICRO-ORGANISMS, INCLUDING BACTERIA AND PROTOZOA. A Practical Manual for Students, Physicians, and Health Officers. By WILLIAM HALLOCK PARK, M.D., Professor of Bacteriology and Hygiene, University and Bellevue Hospital Medical College, and Director of the Research Laboratory of the Department of Health, City of New York. Assisted by ANNA W. WILLIAMS, M.D., Assistant Director of the Research Laboratory. Second edition, enlarged and thoroughly revised. New York and Philadelphia: Lea Brothers and Co., 1905.

IN this book is found a very excellent exposition of the present-day conceptions of the relation of pathogenic bacteria and protozoa to disease. The subject is treated with breadth of view, clearness, and in an extremely interesting manner. The reader is immediately impressed with the care and thoroughness of the revision, and all of the advances in the science which have been made recently appear in the book. The many important contributions from the laboratory of which the author is Director are embodied, and intimate first-hand knowledge of the subject can be everywhere recognized.

The first part of the book is devoted to general considerations, such as methods of isolation of organisms, sterilization, disinfection; and broad conceptions of the relation of bacteria to disease, immunity, and such subjects are dealt with.

In the second part the bacteria pathogenic to man are individually considered. Here the bacteriology of the diseases due to bacterial infection is discussed, and all recent problems in regard to the relation between specific organisms and disease are taken up in a very satisfactory manner. The modern means of dealing

with various micro-organisms are also given, as well as the principles involved in various sanitary problems.

Special attention has been paid to the protozoa, and the third part of the book is given up to a discussion of these organisms. More emphasis is laid upon the subject than has been the case heretofore in such books, because of the rapidly increasing importance which these organisms are found to have in the cause of certain diseases. The recent work of Wright on actinomyces, of Councilman and his co-workers on smallpox, of Schaudinn and Hoffman on *Spirochaeta pallida* is embodied.

This present edition will surely be of much use as a thoroughly up-to-date and interesting treatise on the subject. G. C. R.

SURGICAL ASPECTS OF DIGESTIVE DISORDERS. By JAMES G. MUMFORD, M.D., Visiting Surgeon to the Massachusetts General Hospital and Instructor in Surgery in the Harvard Medical School, in association with ARTHUR K. STONE, M.D., Physician to Out-patients, Massachusetts General Hospital, and Assistant in the Theory and Practice of Physic in the Harvard Medical School. New York: The Macmillan Co., 1905.

PROBABLY no subject is at present of more interest to the progressive internist and surgeon than that of the surgery of the upper abdomen. Its history extends over but about twenty-five years and is by no means complete. The object of the authors of this volume is to present some idea of what may be accomplished by surgical means in the treatment of diseases of the abdominal digestive organs, and this they have done in an eminently satisfactory manner. Of course, there are a great many questions that are still unanswered; these they have treated very fairly, setting forth the opinions of the various authorities. It must not be supposed that this work is one dealing simply with surgery and especially with the technique of the operations recommended. The book is one that will prove of exceptional value to the general practitioner, to whom it will show the great progress that has been made in the treatment of the diseases of the digestive tract. He will also find it of great aid in diagnosis.

The first portion of the book consists of chapters on the ancient conceptions of the digestive organs and on the methods of diagnosing digestive troubles. This portion is written in an entertaining and comprehensive manner, and is most interesting. The different digestive organs are treated separately, but the authors always keep in view the general relationship between the organ under discussion and its neighbors. A large portion of the book is

given to the discussion of the non-malignant diseases of the stomach, especially ulcer of the stomach and duodenum.

The authors have not burdened their pages with a description of obsolete methods. The operations suggested are well chosen from those practised by the masters in abdominal surgery.

References to literature are frequent and extensive. Illustrations are few, as would be expected in a work of this kind.

The chapter on Abdominal Ptois, which deals with a subject which is by no means thoroughly understood, is most instructive.

As an appendix there is included a discussion of "Diagnosis in Connection with Surgery of the Stomach," by Henry F. Hewes.

We can heartily recommend this book not only to the general practitioner, for whom it was especially written, but also to the internist and surgeon.

The one objection that we find in the make-up of the book is that it has uneven and uncut pages. The print is exceptionally large and clear.

J. H. G.

THE DIAGNOSTICS OF INTERNAL MEDICINE. A CLINICAL TREATISE UPON THE RECOGNIZED PRINCIPLES OF MEDICAL DIAGNOSIS. Prepared for the use of students and practitioners of medicine. By GLENTWORTH REEVE BUTLER, SC.D., M.D., Chief of the Second Medical Division, Methodist Episcopal Hospital; Attending Physician to the Brooklyn Hospital; Consulting Physician to the Bushwick Central Hospital; Fellow of the New York Academy of Medicine; Member of the Medical Society of the County of Kings, etc. With five colored plates and two hundred and eighty-eight illustrations and charts in the text. Second edition. New York and London: D. Appleton & Co., 1905.

THE second edition of Butler's work has followed hard upon the footsteps of the first, always a sign of popularity. In its present form considerable new matter and illustration will be found. The work consists of two divisions: the first, which comprises about two-thirds of the entire volume, deals with symptoms and indications; the second, with diseases and differential diagnosis. A new chapter has been added on Diseases of the Mind, by W. A. White, and one on the Diagnostic Use of the *x*-ray, by P. M. Pilcher.

The work contains an excellent section on the physical examination of the lungs. The question of blood pressure, a diagnostic aid which is being used with steadily increasing frequency, has been very satisfactorily dealt with. The chapter on the diseases of the nervous system is illustrated with a number of very ad-

mirable diagrams of the motor and sensory pathways. In a work of such wide scope it is hardly possible that some omissions should not have occurred. One regrets that no mention is made of Mackenzie's polygraph for studying the pulse, and that nothing is said regarding the role of the bundle of His in relation to the Stokes-Adams syndrome. No mention has been made of the stereognostic sense, or of sarcomatosis as a cause of superficial lymphatic enlargement, or of carcinoma as a cause of subcutaneous nodules, or of enlargement of the posterior auricular lymph nodes in German measles. Two statements are made to which exception may be readily taken, *i. e.*, that arcus senilis has no special diagnostic value, and that the ordinary method of percussion of the heart "is of little or no use."

We failed to find any mention of Grocco's triangle under pleural effusion, or of cryoscopy, or of the arthralgias, etc., which follow the injection of antitoxic sera. However, the majority of the foregoing omissions are of inconsequential import, and do not seriously militate against the general utility of the book as a work of reference. There is every reason to suppose that the second edition will prove quite as popular as the first. G. W. N.

A TEXT-BOOK OF THE PRACTICE OF MEDICINE. By JAMES M. ANDERS, M.D., PH.D., LL.D., Professor of Medicine and Clinical Medicine at the Medico-Chirurgical College; Physician to the Medico-Chirurgical Hospital; formerly Physician to the Philadelphia and to the Protestant Episcopal Hospitals, Philadelphia; Fellow of the College of Physicians; Member of the Academy of Natural Sciences, Philadelphia, etc. Seventh edition, thoroughly revised. Philadelphia and London: W. B. Saunders & Co., 1905.

EACH succeeding year brings such an increase in the number of medical books offered to the profession that it seems almost as though much of this kind of literature must become a drug on the market. In the general flood it is rather hard to select the more desirable works for our private libraries, but in the case of this volume the fittest seems to have survived, and this fact is attested by the appearance of its seventh edition.

It is a large volume of over 1200 pages and opens, as do most works on Practice, with the consideration of the Infectious Diseases. The reviewer notes that under this head is classified acute articular rheumatism, the chronic articular and muscular varieties being placed in a separate division and classified as belonging

to those diseases which are of probable infectious origin. The latter section includes, besides the above mentioned diseases, such maladies as Weil's disease, milk sickness, foot-and-mouth disease, and glandular fever.

The author rather favors the view that the diplococcus of Cohn and Treboulet is the causative factor in acute articular rheumatism, but does not refer to the investigations of Poynton and Paine.

In the chapter on Syphilis, he refers to the bacillus of Lustgarten, and those isolated by Neissen, Joseph and Piorkowski as possibly responsible for the infection.

Under the head of diseases of the blood and ductless glands, the author in the article on Hodgkin's disease seems to lean to the theory of its non-tuberculous etiology, mentioning, however, the evidence of Musser and Sailer as being opposed to this opinion. In the rather short article on splenic anemia, he does not make use of or refer to the synonym of Banti's disease.

It is noted that in the section on diseases of the pericardium, cardiopuncture is advised in those cases of pericardial effusion in which the nature of the fluid is doubtful.

The use of tables and parallels is systematically adhered to throughout the work, and to the student, especially, these will be useful, particularly in reading the sections on diseases of the nervous system, where they are quite numerous. A. N.

A LABORATORY MANUAL OF HUMAN ANATOMY. By LEWELLYS F. BARKER, M.B. (Tor.), Professor and Head of the Department of Anatomy in the University of Chicago and Rush Medical College. Assisted by DEAN DE WITT LEWIS, A.B., M.D., and DANIEL GRAISBERRY REVELL, A.B., M.B., Instructors in Anatomy in the University of Chicago. Philadelphia and London: J. B. Lippincott Co., 1904.

THIS laboratory manual differs in many respects from similar works and we believe that these differences show improvement. In the first place the nomenclature, which was formulated by the German Society of Anatomists, has been followed. This certainly simplifies the anatomical names for those students who are unfamiliar with Latin and makes the anatomical terms more comprehensive to all. The older terms have been placed in parentheses after the new ones in order to avoid confusion, and at the end of the volume there is an index of the old and the new terms. The author is pleased to see that this nomenclature is being rapidly adopted by many of the best English and American anatomists.

The book is not supposed to take the place of the descriptive text-book or the atlas, but to be a help and guide to the student in his dissection. The author especially tries in the first portion of the book to teach the student in such a way that he may be led into independent thought and work.

The illustrations number 300 and are excellent: the majority of them have been taken from the German atlases. This book will certainly prove the most helpful manual that has been recently published and the student who follows it closely will derive from it the greatest benefit in his anatomical studies. J. H. G.

THE TREATMENT OF FRACTURES, WITH NOTES UPON A FEW COMMON DISLOCATIONS. By CHARLES LOCKE SCUDDER, M.D., Surgeon to the Massachusetts General Hospital. Fifth edition, thoroughly revised, with 739 illustrations. Philadelphia and London: W. B. Saunders & Co., 1905.

It is unnecessary to say anything in review of this excellent work, as the previous edition was reviewed only about a year ago. We must, however, congratulate the author and the publishers on the marked success which this book has achieved. The present edition is the fifth; it contains some additional illustrations and the text has been modified in certain parts.

As a guide to the treatment of fractures it deserves the high place which it has won for itself. J. H. G.

ATLAS AND TEXT-BOOK OF TOPOGRAPHIC AND APPLIED ANATOMY. By OSKAR SCHULTZE, Professor of Applied Anatomy in Würzburg. Edited, with additions, by GEORGE D. STEWART, M.D., Professor of Anatomy and Clinical Surgery in the University and Bellevue Hospital Medical College, New York. With 25 colored illustrations on 22 Lithographic Plates and 89 Text-cuts, 60 in colors. Philadelphia and London: W. B. Saunders & Co., 1905.

ONE of the greatest helps to the student in studying anatomy is the use of a reliable atlas; in fact, such a work should be considered essential. The present book is a little more than an atlas, as the text, although brief, is concise and complete. It has to deal only with the topographic and applied anatomy, and therefore it will be found of especial value for the practising internist

and surgeon. It is for such that the authors intend the work, and not for the anatomist.

Throughout the volume the relationship between anatomy and the practice of medicine and surgery is never absent from the author's mind. The illustrations are the most beautiful we have ever seen. Most of them are in colors, and these colors are made to represent as nearly as possible the normal coloring of the tissue represented.

We can recommend this book as one of the most satisfactory single volume text-books of applied anatomy.

J. H. G.

THE RELATIONS OF DISEASES OF THE SKIN TO INTERNAL DISORDERS. By L. DUNCAN BULKLEY, A.M., M.D., Physician to the New York Skin and Cancer Hospital, etc. Pp. 175. New York: Rebman Co., 1906.

THE pages of this interesting book are dedicated to the many physicians who have from year to year attended the author's clinical lectures on diseases of the skin, covering a period of thirty years. These lectures form the basis of the present volume. So long ago as 1870 a writer in the *British Medical Journal* expressed the opinion that we needed a critical investigation of skin diseases in their relation to diseases of other organs. Are diseases of the kidney or of the liver frequently productive of them? Are diseases of the intestinal or pulmonary mucous membranes frequently associated with those of the skin? These and like questions are taken up seriatim and freely discussed and investigated by Dr. Bulkley, with the result that we have before us an exceedingly valuable contribution, not only to diseases of the skin, but also to general medicine. It is clearly shown as one reads from page to page that the relationship of many cutaneous diseases to disorders of the general economy and to special disorders of organs within the body is often close. Frequently the so-called affections of the skin are the direct result of disorder or disease far removed from the skin in seat. Dr. Bulkley is well known to the profession, no one better as a skilled clinician. He is thoroughly practical, and is at every point endeavoring to show cause and effect. He introduces the reader to the varied subjects touched upon or elaborated in a style that attracts attention and is often convincing. The subjects of digestive disorders related to skin diseases, of hepatic derangements, of urinary disturbances, of nervous disorders, of circulatory derangements, are all taken up and explained as far as possible in the light of experience and the latest investigations. It is on these lines of thought that the author

gives the result of a life-long study based upon an enormous clinical material, backed with abundant, well-digested data, and draws the conclusions that the proper study and interpretation of skin diseases must go hand-in-hand with general medicine. Without this comprehension of the subject, treatment cannot be otherwise than unsatisfactory. It is the fact that skin diseases have for so long a period—centuries, one might almost say—been regarded as distinct from the general ailments of the economy that has heretofore rendered them so obstinate to treatment. All this and much more to the point are ably and clearly set forth in the volume, and we heartily commend the reading of it to all physicians. An hour or so spent with the book will be the means of disclosing the whole subject of dermatology in a new and satisfactory light. The subject-matter is prepared in a systematic manner and is easy to comprehend. A full index adds much to the value of the book.

L. A. D.

ORGANOTHERAPY. By H. BATTY SHAW, M.D. (Lond.), F.R.C.P.,
Lecturer in Therapeutics, University College, London; Assistant Physician to University College Hospital and to the Hospital for Consumption and Diseases of the Chest, Brompton. Pp. 256.
Chicago: W. T. Keener & Co., 1905.

THIS very timely volume, dealing with treatment by means of preparations of various organs, considers the thyroid, parathyroid, and suprarenal glands; substances derived from the alimentary tract, including the pancreas and liver; from the genitourinary organs (testicle, ovary, kidney); from other organs and tissues, as the pituitary body, the thymus, the spleen, hemolymph glands, lymphatic glands, marrow, muscle, nerve tissue, and placenta. It will be found that this work is comprehensive in scope, containing a sufficient number of illustrations, abundantly supplied with references to original investigations, and withal its subject very attractively and concisely presented. As might be supposed, considerably more than one-half of the subject matter is devoted to the thyroid and suprarenal glands; yet if we compare our rapid increase of knowledge along these lines, the results of thorough study of these substances afford us an earnest of what may be expected when the same study shall have been devoted to the other glands, tissues, and substances which are here briefly described, but which are likely to become of almost equal importance. The active practitioner will find within the compass of this little volume what should be of the most urgent interest and a necessity for complete therapeutic information.

R. W. W.

PROGRESS OF MEDICAL SCIENCE.

MEDICINE.

UNDER THE CHARGE OF

WILLIAM OSLER, M.D.,

REGIUS PROFESSOR OF MEDICINE, OXFORD UNIVERSITY, ENGLAND.

AND

W. S. THAYER, M.D.,

PROFESSOR OF CLINICAL MEDICINE, JOHNS HOPKINS UNIVERSITY, BALTIMORE, MARYLAND.

Uterine Myomas, Heart Disease, and Disorders of the Ovaries. KESSLER. (*St. Petersburg. Med. Woch.*, 1905, xxx, 421.) The association of degeneration of the heart muscle with myoma of the uterus has in the past few years received a great deal of attention from gynecologists. Striking instances occurring over and over again have directed attention to it. A patient with myoma is admitted to the hospital and dies, without symptoms other than a gradually failing heart, before an operation can be performed. Another patient with myoma after a trivial operation develops marked cardiac insufficiency. Another patient dies suddenly during convalescence from operation after making some slight exertion. In these patients, thromboses and infections frequently and quite unexpectedly occur when there is nothing to account for them but a low resistance, and for this low resistance poor circulatory conditions. Of twenty fatal cases of embolism in gynecological diseases collected by Kessler, 40 per cent. were in patients with myomas. Recently, Fleck, has emphasized how very easily these patients are affected by anesthetics. Intoxication symptoms frequently develop before consciousness and the reflexes are lost.

It was assumed that the severe and frequent bleedings, the disturbances of nutrition, and the enforcement of a long-continued rest account for the changes in the heart muscle. But Brasin, in 1893, pointed out that similar conditions existing in carcinoma had no such result. Strassman and Lehmann, in seventy-one carefully recorded consecutive cases, found that 40.8 per cent. showed definite subjective or objective signs of an organic heart lesion. In some of these patients the myo-

mas were very small. Veit, in his text-book, had some years before noted the frequent occurrence of asthmatic attacks in young women with relatively small tumors, and indeed suggested that these attacks were of importance in the early diagnosis of myoma. Veit thought the connection between the two was through the nervous system, but all the evidence is now with Strassman and Lehmann, who refer the dyspnoea to changes in the heart muscle or bloodvessels. These authors go still further and cite instances to show that the cardiac symptoms may develop before there is any suspicion of pelvic trouble. These are points of great importance, as they indicate that instead of being dependent one upon the other both the myomas and the cardiac changes must be referred to a common cause.

The presence of some intoxication to explain both immediately suggests itself, and the ovary has been selected as the possible point of its origin. The influence the ovaries exert upon metabolism is shown in the phenomena of the climacterium, in the diminished oxygen consumption after castration, which can be again increased by feeding oophorin, the increased fat deposit after removal of the ovaries, and the fact that such a serious anomaly as osteomalacia may be brought to a standstill by their removal.

These features are explained as the effects of an internal secretion, and one may assume that under abnormal conditions this altered secretion might be toxic for the heart muscle. This is, of course, all assumption and not capable of direct proof. The remarkable influence the ovaries exert over the circulatory conditions in the uterus is, of course, well known, and as myomas in their development bear such close relationship to the bloodvessels it is possible that changes in the ovaries might lead to their formation. It is of great moment then to note if the ovaries in patients with myomas are always diseased. Fleck states that gross anatomical lesions of the ovaries are always found in patients with myomas, but Kessler believes this to be an over-statement, and is convinced from his own experience and the opinions of others that in many cases the ovaries are at least macroscopically normal. He further offers as objections to the validity of the ovarian hypothesis the circumstance that enucleation of one or more myomas is seldom followed by recurrence, and that myomas may grow very rapidly and attain a large size long after the climacterium.

The clearing up of the points raised in this paper is evidently of the greatest importance in the surgical treatment of these tumors. If the ovaries are at fault the method to pursue is evident. Much valuable assistance must come from the internists who, as a rule, see these cases earlier than the surgeons, and it is particularly in regard to the early stages that statistics are needed. The character of the lesion in the heart muscle also needs to be determined. There is very little carefully collected pathological data.

The Pathogenesis of Tetany.—PINELES (*Deutsches Arch. f. klin. Med.*, 1906, lxxxv, 491) in a previous communication sought to show that tetany following extirpation of the thyroid gland depends upon the destruction of the parathyroids. Clinically, no symptoms of tetany occur if these organs are left. Experimentally, animals with excised parathyroids show symptoms in every manner analogous to tetany in man. Pineles then goes very extensively into all the symp-

toms occurring in the various forms of tetany—the tetany of laborers, the tetany in acute infectious diseases, the tetany in pregnancy, the tetany in stomach disease, and the idiopathic tetany of children—analyzes them all and shows that even in minor details they are analogous to the symptoms observed in tetany strumapriya and to the symptoms of thyroidectomized animals. This remarkable similarity of all the symptoms suggests at once that a single poison is responsible for all. The tetany following the removal of the thyroid in man and animals we know is due to the destruction of the parathyroid bodies. The condition of the parathyroid in the other forms of tetany has not been definitely established.

In connection with this communication it may be well to recall the fact that McCallum in a case of fatal gastric (dilatation) tetany found the parathyroids in a condition of active hyperplasia with numerous mitotic figures, suggesting strongly the possibility that "the parathyroids had become hypertrophied to neutralize large absorption of toxin from the stomach."—*Johns Hopkins Hospital Bulletin*, 1905, xvi, 148.

Endocarditis in Tuberculosis.—SORGO and SUEZ (*Wien. klin. Wchnschr.*, 1906, xix, 176) report at length the clinical history of a girl, aged sixteen years, who died of a slowly progressing pulmonary and laryngeal tuberculosis and amyloid disease. The condensed autopsy report reads: Chronic fibroid phthisis with cavity formation of both upper lobes; disseminated miliary and conglomerate tuberculosis in both lower and the right middle lobes; ulcerating tuberculous infiltration of the larynx and trachea; extensive tuberculous ulceration of the ascending colon; scattered tuberculous ulceration in the small intestine; microscopic tuberculous areas in the spleen, liver, and kidneys; amyloid degeneration of the spleen, liver, and kidneys; verrucose endocarditis of the mitral valve.

The endocarditis gave no symptoms during life and was not diagnosed. Along the border of the aortic segment of the mitral valve and to a much less extent along the border of the opposite segment are numerous pale yellow, uneven, firm, warty excrescences. The largest of these measure about 2 x 4 mm. and are situated just at the free border of the valve. Their central and basal portion consists of compact bundles of spindle-shaped cells, poor in protoplasm which proceed without definite demarkation from the normal valve tissue. The periphery consists of a homogeneous eosin-staining mass indistinctly separated from the dense central portion by a more cellular layer made up of connective tissue cells rich in protoplasm and a small number of leukocytes. In the small nodules the firm connective tissue is often wanting, and they appear to be fastened directly upon the abraded epithelium of the valve. In both forms the interstices are filled with a fibrin net-work enclosing blood corpuscles, principally polymorphonuclear leukocytes, and containing numerous tubercle bacilli. None of the tissue shows any evidence of tubercle formation. Cultures from the vegetations gave a pure growth of tubercle bacilli and no other organisms were found in microscopic preparations.

Cases of true tuberculous endocarditis are rare. From a review of the literature Sorgo and Suez are willing to accept only six reported instances as genuine. The case of Brailon and Tousset is particularly

interesting. Clinically, it ran the course of a septic infection and tubercle bacilli were obtained from the blood during life. At autopsy, tuberculous vegetations were found on the heart valves without pulmonary or glandular tuberculosis, and Braillon and Tousset present the case as one of primary tuberculous endocarditis. It is a matter of difficulty in a given instance to decide whether an endocarditis is tuberculous or not. The histological picture is not sufficient, as under some circumstances tuberculous lesions have no specific structure. The sterility of the vegetations is not decisive, as even septic organisms may disappear from old deposits. Even the presence of tubercle bacilli may be equivocal, as they may have lodged upon an old lesion or have secondarily infected marantic thrombi. The cardiac vegetations not uncommonly found in chronic tuberculosis have been interpreted as tuberculous in nature by one class of authors, and as due to secondary infections by others. Hanot and Londe and Petit have concluded that they are due to the effects of toxins on account of their uniform failure to demonstrate tubercle bacilli.

Michaelis and Blum were the first to approach the problem experimentally. After rupturing the aortic valves through the carotid they injected tubercle bacilli and observed the formation of verrucose vegetations and noted in one case a typical tubercle in one of the vegetations. Of course, these experiments do not represent conditions as they normally occur in patients. Bindo de Vecchi repeated them but was unable to discover in the nodules forming on the valves any specific characteristics. Further, he produced in rabbits corneal tuberculosis and then injected coal-dust into the circulation or else ruptured the valves and in both instances discovered nodules on the valves similar to those obtained by following the procedure of Michaelis and Blum. As the corneal tuberculosis remained strictly localized and as the valve changes present no specific characters he concludes that the deposits are due to the tuberculous toxins. This view was further strengthened by showing that injection of other toxins, namely, diphtheritic, staphylococcic, etc., together with coal-dust produces the same manner of nodules. Prochaskas, working with organisms other than tubercle bacilli found that while various toxins of themselves do not produce endocarditis they do facilitate the lodgement of bacteria upon the heart valves. De Vecchi's experiments need confirmation before they can be generally accepted. Bernard and Salmon by injecting a tubercle bacillus emulsion directly into the carotid or left ventricle observed two kinds of lesions in the valves. The areas were all subendothelial, those between the endothelium and the elastic lamina consisting of a fibrinous exudate with numerous leukocytes and a few scattered tubercle bacilli, but without specific structure, while the areas below the lamina consisted of typical tubercles. These results agree with the observations of Orth, who describes the valvular changes in acute miliary tuberculosis as almost constantly subendothelial, and they illustrate too how definitely tuberculous lesions may lack a typical tubercle formation. Sargo and Suez think the circulatory conditions in the valve probably explain this difference.

SURGERY.

UNDER THE CHARGE OF

J. WILLIAM WHITE, M.D.,

JOHN RHEA BARTON PROFESSOR OF SURGERY IN THE UNIVERSITY OF PENNSYLVANIA;
SURGEON TO THE UNIVERSITY HOSPITAL,

AND

T. TURNER THOMAS, M.D.,

ASSISTANT SURGEON TO THE UNIVERSITY AND PHILADELPHIA HOSPITALS, AND ASSISTANT
INSTRUCTOR IN SURGERY IN THE UNIVERSITY OF PENNSYLVANIA.

Spontaneous Cure of Congenital Luxation of the Hip of One Side in Certain Cases of Double Congenital Luxation.—FROELICH (*Revue d'Orthopedie*, January, 1906) says that it not infrequently happens that during the progress of a congenital luxation of one hip the opposite side is found to be equally dislocated. Froelich has found it present when the skiagraphic diagnosis showed the joint to be normal. It is well known that the luxation very often does not exist at birth, but is produced when the child begins to walk, in consequence of defective relations between the femoral head and the articular cavity. These relations may be sufficiently good to permit no defective position of the limb menaced by the luxation. It is when the reduced and evidently affected limb is placed in the abducted position that the displacement occurs on the opposite side, which then seeks an adducted position to preserve the parallelism of the two limbs. Adduction causes the head of the femur on the apparently sound side to rise up over the posterior border of the acetabulum. Not all so-called congenital luxations deserve that name, in the sense that an anatomical predisposition prepares the way for the dislocation. Froelich has seen it occur in the course of subacute arthritis of the hip, due to an attenuated gonococcic infection, or an osteomyelitis.

He reports two cases of congenital luxation in which there was a spontaneous cure on one side. In both, one of the hip-joints is sound as proved by the x -rays and examinations. The gait of both is that of a unilateral luxation. One patient was five years, the other seven years old. Skiagrams taken when each was two years old clearly showed double luxations. The parents of one could determine a difference between the original waddling of the child and the unilateral halting which developed later. The presence of a double luxation in an older sister facilitated the comparison. The explanation of the cure is found in the positions assumed by the two limbs during the progress of the cure. In both the luxated side was in adduction. During walking the opposite side must assume the position of abduction to preserve the parallelism of the limbs. As already stated, adduction favors the passing of the femoral head over the posterior border of the acetabulum into a dislocated position, while the forced abducted position of the other side favors the gradual entrance of the head into the cavity. In other words nature does what the surgeon does in his efforts to cure a congenital luxation, when he puts the thigh in forced abduction.

The Operation of Mikulicz in Chronic Muscular Torticollis.—ROUSSEAU (*Revue d'Orthopédie*, January, 1906) says that while chronic muscular torticollis is often cured by simple orthopedic treatment or by tenotomy, the more inveterate cases lasting many years and associated with grave scoliosis and extremely marked craniofacial asymmetry require more important surgical treatment to bring about a cure or notable amelioration. He reports such a case in which total extirpation of the muscle, Mikulicz' operation, was performed, with good results. Mikulicz found in his first total extirpations that the spinal accessory nerve was injured, and so he decided to do a partial resection, reserving the more complete operation for a few cases. He made an incision 3 to 4 cm. long, between the sternal and clavicular portions of the muscle. After retracting the edges of the wound he isolated, with his fingers and then divided with a bistoury, the two heads, protecting with a retractor the underlying important structures. Each head was then seized with a forceps and drawn out of the wound. With the finger aided by scissors the muscle was isolated to the junction of the two portions. By exaggerating the pathological position of the head and neck the muscle was gradually drawn further out of the wound and isolated up to the mastoid process. It was there divided, the operator being careful to avoid the external branch of the spinal accessory nerve. Search was then made for any intact fibers which were divided. The wound was closed without drainage, and the head immobilized in the normal position.

The postoperative treatment is very variable, some using plaster-of-Paris, others more or less complicated bandages. In about a week active and passive movements and massage should be begun. The head in most cases finally occupies a normal position, looking forward, but in a certain number it is somewhat displaced as a whole to the sound side, in a few to the affected side. The head and neck are freely movable in nearly all cases. The scoliosis which resulted from the torticollis was with rare exceptions ameliorated, even without consecutive orthopedic treatment.

In all young infants, since the cause of the craniofacial asymmetry is removed, the degree which already exists will almost entirely disappear with time. In patients above fifteen years of age it is but little influenced.

The recurrences which have been reported merely show that very often not only the sternomastoid but all the neighboring parts take part in the process of fibrous degeneration and contraction which is responsible for the deformity, so that every adherent and contracted band must be destroyed. While resection of the muscle may fail in some very rare cases, it is well to bear in mind that it very often succeeds when the other methods have failed.

Rousseau reaches the following conclusions: (1) In very grave, inveterate cases of chronic muscular torticollis the Mikulicz operation should be performed. (2) The total operation is the most efficacious. The spinal accessory nerve on account of its size can easily be dissected. (3) After the operation, orthopedic treatment will be useful to give the muscles of the neck their tonicity and more so especially to correct as far as possible the scoliosis. (4) Sooner or later the situation and mobility of the head will return to the normal, the scoliosis will ordinarily be ameliorated, but usually the craniofacial asymmetry will not be modified.

Sexual Precociousness and Impotence.—FERE (*Annales des Maladies des Organes Génitourinaires*, January 1, 1906) says that precociousness or prematurity is often associated with other anomalies of evolution. It has been shown to be at times a prelude to genius, at other times to insanity, and in some cases a coincidence of a remarkable aptitude with a decided incapacity. It can be followed by a partial imbecility, as impotence, as in a case reported by the writer. To what extent can impotence be relieved by treatment?

By experimentation on the lower animals, especially the rabbit, Fere was successful in some cases in producing an erection with cantharides. It was accompanied by pain, avoidance of the female, and not the least tendency to copulation. Pathological priapism in man does not suggest sexual relations, and toxic priapism can be only sexually imperfect. The cantharides gave a toxic not an aphrodisiac action. The peripheral excitation was not sufficient for copulation.

Phosphorus and strychnine have been extolled for their value in overcoming impotence. Fere has found that they only rarely provoke erection, and then with no desire for sexual relations. The instincts of the lower animals do not call for artificial stimulants. With regard of the use of yohimbine in rabbits, Fere has found that parietic and spasmodic troubles arise from it, but no change in the size or shape of the testicles or penis.

The Diagnostic Value of the X-rays.—DAVIDSON (*British Medical Journal*, January 20, 1906) says that minute particles of metal or glass can be localized in the orbit or eyeball to the one-fiftieth of an inch. The opacity of a substance is in proportion to its atomic weight, so that if the composition of a renal calculus is known then its relative opacity is also known. Uric acid and urate of ammonium calculi are almost as transparent as flesh; whereas oxalate of lime, phosphate of lime, and even a cystic oxide calculus are fairly opaque, owing to the sulphur in it. It is quite likely that a small uric acid calculus in a stout individual may escape detection.

Primary Suture without Drainage in Acute Appendicitis.—BORELIIUS (*Zentralblatt f. Chirurgie*, January 27, 1906) reports one hundred and twenty-three cases of appendicitis from the University clinic at Lund. One hundred and eight were operated on, fifty-nine in the acute stage and forty-nine in the chronic or interval stage. Four died, all in the acute stage. Forty-three were drained. In sixteen the abdomen was closed by layer sutures, the operation being performed from the first to the third day. Healing by first intention occurred in all, except for a superficial stitch abscess in one. The average stay in the hospital was from twelve to seventeen days. Those cases in which drainage was employed remained in the hospital from sixteen to thirty-eight days. In some of these a rubber tube or gauze drain was employed for a few days only, and in them the healing was rapid.

The earlier one operates the more frequently can the abdomen be closed afterward. The decision to close will not depend so much upon the time as upon the condition of the appendix and of the neighboring peritoneum. If the appendix has not perforated and can be taken out without perforation, in general the abdomen can be closed. This may be done also when the appendix is gangrenous if the peritoneal fluid is clear. In eight of the writer's sixteen cases it

was gangrenous, in the other eight only catarrhal changes had occurred. He would counsel the inexperienced operator, if in doubt, to drain freely. The incision may often be small, but should be enlarged according to the needs of the case. The appendix should be removed whenever possible.

Carcinoma of the Breast and its Spread into the Lymphatics.—Lockwood (*British Medical Journal*, January 27, 1906) states that the spread of cancer along the lymphatics depends for its rapidity to a large extent upon the position of the primary growth. In a hollow muscular organ like the urinary or gall-bladder the pause may be months or years. In the mammary gland, which has no capsule, the tongue, or the pharynx, there is hardly any interval of time between the onset of the growth and its spread into the neighboring lymphatics. Lockwood makes an immediate microscopic examination of the smallest and most innocent looking tumors of the breast, and follows this up by a similar investigation of the neighboring glands. Not all enlarged glands associated with neighboring cancer are cancerous. Indeed some of the larger ones may be non-cancerous while the smaller ones are cancerous. In one case of cancer of the breast the axillary glands were shown to be tuberculous. There is little doubt that the lymphatics of the two breasts intercommunicate across the sternum, which explains some of the cases of later involvement of the second breast, although it fails to explain all of them. For instance Lockwood reports one case in which the first breast showed a duct cancer. Within four months a nodule appeared in the opposite breast which was a spheroidal celled carcinoma undergoing colloid change. The subclavian glands demand attention whether the axillary glands are or are not enlarged. Ordinarily, Lockwood contents himself with a thorough dissection above and below the axillary and subclavian veins as far as can be reached by raising the clavicle upward, although when the glands in the neck are evidently involved, he does not hesitate to make an extensive dissection for their removal.

A Case of Polycystic Calculous Nephritis; Anuria; Renal Decapsulation.

PATEL (*Annales des Maladies des Organes Genitourinaires*, February 1, 1906) says that on admission to the hospital his patient had not passed urine for six days, and was consequently in a very bad condition. No urine could be obtained by the catheter. She gave a previous history of old attacks of renal colic on the left side, followed by the passage of small calculi. The symptoms seemed localized to the left side and operation was done on that side only. The kidney was studded with multiple cysts, and nephrotomy was considered well-nigh impossible. Instead, as thorough a decapsulation as possible was performed. After operating the urine flowed freely, but the patient died five days later. Autopsy showed both kidneys enlarged and cystic, the right being the larger of the two. In the pelvis of the left kidney were four calculi, in that of the right kidney two calculi. No part of the renal tissue had a normal appearance, but it was hard and lardaceous. The microscope showed that the lesion corresponded more to that of a chronic nephritis with large cysts than to a polycystic kidney.

Renal decapsulation, done in the presence of complete anuria, when nephrotomy is impossible, has re-established the passage of urine. Nevertheless the kidney should be opened, when there is no contraindication.

THERAPEUTICS.

UNDER THE CHARGE OF

REYNOLD WEBB WILCOX, M.D., LL.D.,

PROFESSOR OF MEDICINE AND THERAPEUTICS AT THE NEW YORK POST-GRADUATE MEDICAL SCHOOL AND HOSPITAL; VISITING PHYSICIAN TO ST. MARK'S HOSPITAL.

ASSISTED BY

HENRY HUBBARD PELTON, A.M., M.D.,

INSTRUCTOR IN MEDICINE IN THE NEW YORK POST-GRADUATE MEDICAL SCHOOL AND HOSPITAL; CHIEF OF THE MEDICAL CLINIC, PRESBYTERIAN HOSPITAL DISPENSARY, NEW YORK.

The Pneumatic Cabinet in Organic Heart Disease.—DR. CHARLES E. QUIMBY concludes a paper upon this subject with the following statements: (1) The pneumatic cabinet does not cure incurable organic heart lesions. (2) After nearly thirty years' observation and reasonably careful study of results obtained by other methods, in the hands of acknowledged authorities, and fourteen years' personal experience in the use of the cabinet the author is firmly convinced that it affords more immediate, extensive, and lasting relief than any other known measure. (3) That its use is based upon such strictly scientific principles, and the results are so plainly determined by established physical laws, as to justify its description as the nearest approach to the ideal method of treatment in organic cardiac disease.—*Boston Medical and Surgical Journal*, 1906, No. 20, p. 543.

The Treatment of Nervous Pain.—DR. F. LOTS believes that the profession is mistaken in its tendency to neglect these manifestations. The natural tendency to make light of these pains is wrong. The nervous patient is naturally inclined to exaggerate his symptoms, but it is a fact that in many instances his skin is hypersensitive. Consequently, means should be employed to render the cutaneous resistance greater, and this is best accomplished, according to the author, by subjecting the skin to repeated and intense irritation. Frictions with a rough fabric of cotton should be energetically administered and at frequent intervals, the procedure being continued for from one to two hours daily. The pains which respond most rapidly to the treatment are those in the back, those referred to the precordium, and the acroparesthesiæ. In sciatica the frictions are also useful. *Therapeutische Monatshefte*, 1906, No. 3, p. 118.

The Treatment of Tetanus by Magnesium Sulphate.—DR. JOSEPH A. BLAKE, incited by the fact that magnesium sulphate when injected by lumbar puncture inhibits both afferent and efferent nerve impulses, has employed this drug in the treatment of tetanus; he reports an instance of the disease in which recovery followed five intraspinal injections of 25 and 12.5 per cent. solutions within ten days. The quantity injected of the stronger solution was about 67 minims; of the weaker, which was employed on every occasion except the first, 2 drams. The author reports a second case which resulted fatally, although the magnesium

sulphate injections had a noticeable effect upon the symptoms. He considers that he is justified in claiming that this form of treatment has the following points in its favor: (1) A marked effect in restraining the convulsions and relieving pain, thereby conserving strength and preventing excessive metabolism and heat production. (2) That the spasm of the muscles of mastication is at least lessened, thereby permitting feeding. (3) That the action of the drug is continued for a considerable period (twenty-nine to thirty-seven hours) without depressing action upon the heart muscle. (4) That in one instance at least repeated injections produced no harmful effect, except the inhibition of the bladder and the consequent need for catheterization. No specific action is claimed for the magnesium sulphate, although the drug may have some chemical action upon the toxins. The conservative view is to consider its effect purely symptomatic.—*Surgery, Gynecology, and Obstetrics*, 1906, No. 5, p. 541.

The Treatment of Exophthalmic Goitre.—DR. PAUL SAINTON after a considerable experience advises treatment by means of the serum of thyroidectomized sheep. The thyroid gland of the animal is totally excised but the parathyroids are left in place. The first blood is drawn by means of jugular puncture about three or four weeks after the operation; the serum is filtered and rendered absolutely sterile; the addition to it of such antiseptics as carbolic acid does not seem to impair its efficiency. The dosage varies from 35 to 45 minims every two days, depending upon the patient's condition, and the serum is taken in water or wine. The treatment is continued under the same dosage for three or four weeks, when it is discontinued for a week; it is then resumed for fifteen days in every month. The entire duration of the treatment is variable, but usually is from six months to one year, the periods of intermission being lengthened as the patient improves. Under the influence of the serum the size of the thyroid, the exophthalmos, the tachycardia, and the tremors progressively diminish. After the establishment of cure it is best to advise the patient to take the serum for about fifteen days during each following year.—*Revue de Therapeutique*, 1906, No. 7, p. 217.

Jez's Antityphoid Extract in Enteric Fever.—V. JEZ reports four additional cases treated by his method and summarizes those hitherto reported by him and others. Of these there have been one hundred, and in all but six, in which the results obtained have been characterized as dubious, the treatment has acted most favorably. There are said to be no contraindications to the administration of the extract and it may be given either hypodermically or by the mouth. The author gives it by the latter channel, and in hourly doses of a tablespoonful. The total amount administered is from 24 to 30 ounces. In the author's opinion and in that of others this is a distinct advance in the treatment of enteric fever, since it causes a rapid amelioration of all the symptoms and shortens the course of the disease from one to two weeks.

Wiener klinisch-therapeutische Wochenschrift, 1905, No. 51, p. 1277.

The Calcium Salts in Certain Headaches.—GEORGE W. ROSS states that there occurs often in women and less frequently in men a headache having the following characteristics: (1) It is present and most severe

on waking and tends to lessen or to disappear in from one to six hours. (2) It is usually a dull, heavy ache or a frontal or temporal throbbing; less often is it vertical, occipital, or unilateral; rarely is it neuralgic. (3) It is chronic and intractable, but may exhibit itself as the common occasional headache to which many are subject. (4) It is associated with a deficient coagulability of the blood. The subjects of this form of headache are usually of the lymphatic type. The expression is heavy and listless, the face is full and the eyes puffy, anemia is often present, and the whole bearing indicates mental and physical lassitude. Symptoms which are often associated with the headache are pain after eating, constipation, oedema of face or extremities, dyspnoea, chilblain or urticaria, and neuralgia. As treatment the author has employed the following in a number of cases with success: A calcium salt has been given in order to increase the coagulability of the blood; the lactate is to be preferred and may be administered in a mixture containing 15 grains of this drug, half a minim of tincture of capsicum, and an ounce of chloroform water, to be taken three times a day before meals. If the lactate cannot be obtained the chloride may be substituted, 15 grains in an ounce of camphor water. Calcium lactate may be combined with bitters and with iron and strychnine, but not with alkalies or alkaline carbonates. The constipation should receive appropriate treatment and the admixture of a certain amount of milk to the diet is advisable. The regimen should be simple; alcohol, shell-fish, and strawberries should be avoided. The author suggests that the calcium salts may be useful in neuralgias when accompanied by diminished coagulability of the blood, and in migraine. He had treated six patients suffering from chronic nephritis with these salts and in five the headaches and oedema were greatly lessened.—*The Lancet* 1906, No. 4299, p. 143.

Drugs in Uric Acid Conditions.—JAMES F. GOODHART believes that all the uric acid solvents, so much vaunted, appear to be equally useless for that purpose, but considers that salines have their value, if given with discrimination, for facilitating the excretory power of the abdominal glands; in this way, water is probably one of the best remedies, but should not be drunk to excess, since the popular belief that water being harmless, and may be drunk in any quantity, is very possibly untrue. In the author's opinion a half-dram of potassium bicarbonate in a glass of water taken at bedtime to stem the nightly tide of uric acid is one of the most useful recommendations, aside from tonics, cures at watering places, and change of scene and air.—*The Practitioner*, 1906, No. 1, p. 9.

The Action of Drugs in Diabetes.—KARL FLEISCHER considers it difficult to decide what action drugs really exert in diabetes, since the elimination of sugar by the urine is subject to spontaneous variations, due to intercurrent conditions, the general state of the patient, and to emotional influences. In his opinion opium produces the most permanent results. Its derivatives are less potent. The theory that diabetes is due to abnormal fermentation has led to the administration of various substances in the hope of preventing these. Most of the drugs given with this idea are of little use, although some of them may prove to a slight extent beneficial.

Aspirin acts well in mild cases and salol may prove effectual. Piperazin given a half-hour after meals, the gastric contents having been previously neutralized by sodium bicarbonate, is appropriate. Many other substances have been given on this theory and upon that that diabetes results from an insufficiency of the glycolytic ferment. Among the latter are beer yeast, hepatic and pancreatic extracts, but these as well as decoctions of various vegetable drugs seem to exert no specific action, with the possible exception of jambul, which, in connection with a proper dietary, may be given to advantage. The author concludes that, with the sole exception of opium, no drug has any specific action in diabetes. *Therapeutische Monatshefte*, 1905, No. 10, p. 497.

Doyen's Cancer Serum.—ALEXIS THOMSON reports four instances of cancer in which Doyen's serum was administered. The first was a recurrent scirrhus of the breast in obviously hopeless condition from the beginning of the treatment. Injections of the serum were given at intervals, but death took place in about three months; no improvement whatever was noted, but on several occasions there was a temperature reaction. The second was also a recurrent mammary scirrhus in an apparently otherwise healthy woman and fulfilling the conditions laid down by Doyen for successful treatment by means of his serum. A secondary operation preceded by a course of serum injections was decided upon; the operation was performed and followed by further injections, but the growth recurred and, although its progress was slow and the patient's general health was better than is usual under such conditions, death took place seven months after the operation. The third was an unfavorable one for serum treatment from the first. It was an enormous epithelioma of the jaw and treatment was without avail. The fourth was an instance of mistaken diagnosis and not of malignant character. It is interesting solely because the reactions following the serum injections were quite as marked as in the malignant cases described above. The author concludes with the statement that the cases are recorded not because in themselves they afford grounds for deciding the efficacy of Doyen's serum, but because when added to others they may help in the solution of this question.—*The Edinburgh Medical Journal*, 1906, No. 1, p. 53.

Marmorek's Serum in Tuberculosis.—TH. STEPHANY concludes his observations upon this means of combating tuberculosis with the following statements: Marmorek's antituberculous serum has a remarkable curative action in pulmonary, pleural, and osseous tuberculosis. It is able to arrest the course of the disease and to institute cure; under its influence various symptoms, notably pain, are greatly ameliorated. It may be employed without danger, if the technique is proper, in all forms of tuberculosis. The author injects the serum in doses of from 15 minims to 3 drams, depending upon the temperature, reaction, and the local effect, at two-day intervals. He usually employs gradually increasing dosage and interrupts the treatment from time to time.—*Le Progrès médical*, 1905, No. 46, p. 835.

OBSTETRICS.

UNDER THE CHARGE OF

EDWARD P. DAVIS, A.M., M.D.,

PROFESSOR OF OBSTETRICS IN THE JEFFERSON MEDICAL COLLEGE, PHILADELPHIA, ETC.

Palpation of the Ear in Diagnosticating Vertex Presentations.—STOWE (*Surgery, Gynecology, and Obstetrics*, June, 1906) calls attention to the fact that in many complicated and difficult cases it is impossible to reach the fontanelles; especially in forceps delivery, he believes that before the forceps is applied, while the patient is anesthetised, the fingers should be carefully passed over the head to reach an ear. The location of the ear at once gives information concerning the sagittal suture. Further palpation of the ear will enable the obstetrician to determine whether the fingers pass from the occiput to the forehead or from the forehead to the occiput. In this way the physician can recognize the anterior or posterior position of the occiput; the further anterior the occiput is situated the more readily can the ear be felt.

In many cases this method cannot be utilized until the cervix is fully dilated and the patient under deep anesthesia. It does not expose the patient to additional danger.

Lumbar Puncture in Eclampsia.—THIES (*Zentralblatt f. Gynäkologie*, No. 23, 1906) reports seventeen cases of lumbar puncture with extraction of fluid in eclampsia, occurring in Zweifel's clinic at Leipzig. This treatment was carried out not as curing eclampsia, but as diminishing the irritation of the nervous system occasioned by the pressure of cerebrospinal fluid.

The patient was placed upon the side in such a posture that the spinal column was rendered convex and curved backward. The puncture was made 0.5 cm. from the middle line and the needle directed slightly inward. In sixteen of the seventeen cases the spinal canal was entered at once; by this method fluid was allowed to escape very slowly, from ten to twenty minutes being occupied in securing the fluid. When the normal pressure of 120 mm. was secured the needle was withdrawn. During the actual time of puncture there were no symptoms of irritation. In some cases after the puncture there was vomiting, twitching of the muscles, irregularity of the pulse and breathing, and symptoms of irritation of the spinal cord.

The fluid obtained was usually clear, a few leukocytes were present, and in one case the fluid was cloudy, containing abundant leukocytes and a few red blood corpuscles. In one case the fluid was bloody and was thought to indicate hemoglobinemia. After the puncture in this case the convulsions ceased and the patient soon recovered consciousness. During the following night she developed severe jaundice with hemoglobinuria and died in coma. Hemorrhages were found in the liver and in other portions of the body, showing extensive disorganization of the blood.

The tension of the fluid was always raised in eclampsia. When the tension was above 200 mm. the cases were severe and an unfavorable

prognosis was indicated. In one case the tension reached 600 mm. In one case the secretion of urine diminished very considerably after the puncture. The mortality in these cases was high, but the puncture was considered only as a means of lessening irritation and not as a curative measure.

Vaginal Cesarean Section or Retroflexion and Incarceration of the Pregnant Uterus.—BENNECKE (*Zentralblatt f. Gynäkologie*, No. 23, 1906) reports the case of a patient five months pregnant who had retroflexion and incarceration of the uterus. Cystitis was present, with death of the fœtus. As the cervix was long and resisting it seemed safest to empty the uterus by vaginal Cesarean section.

In separating the bladder the bladder wall prolapsed and was ruptured, and urine was discharged. The rupture was at once closed by catgut. On examination it was found that the bladder wall had been compressed against the symphysis, producing softening and partial necrosis. The uterus was opened in the anterior wall, the fœtus and its appendages removed, and the uterus tamponed with gauze. The incision was then closed, a permanent catheter being placed in the bladder. Small strips of xeroform gauze were placed anteriorly and posteriorly to the uterus to drain the region of the bladder. The bladder made a good recovery, disturbed for a short time by a brief but not severe attack of cystitis.

Ovarian Pregnancy.—KELLY and MCILROY (*Journal of Obstetrics of the British Empire*, June, 1906) report the case of a multipara in good health, who, after six week's interruption of menstruation was taken with severe pain in both iliac regions. This was followed by intermittent vaginal hemorrhage. The patient lost strength and weight and was admitted to the hospital. On examination there was tenderness over the left iliac region, but no tumor could be detected. The uterus was slightly enlarged; the left appendages formed a considerable mass, tender to pressure; while the right appendages were also exceedingly tender. After some delay abdominal section was performed, and on the left ovary was found a bloody cyst as large as a good-sized plum. The ovary and tube were removed. The patient made an uninterrupted recovery. On examination of the specimen the tube was found invaginated. The pregnancy had been ovarian and chorionic villi and syncytium were detected. The whole ovisac was composed of ovarian tissue. The pregnancy had been within a Graafian follicle. Lutein cell tissue was found almost directly adjoining fœtal tissue, separated from it by a layer of fibrin and connective tissue. No rupture had occurred, but at the lower portion the tissue was greatly thinned out. No decidual cells were found in the Fallopian tube. The fœtal structures were entirely surrounded by ovarian tissue.

Ectopic Pregnancy.—HAULTAIN (*Journal of Obstetrics of the British Empire*, June, 1906) reports his experiences in thirty cases, supposed to be ectopic pregnancy. Some of these were wrongly diagnosed, so that the number verified by operation was reduced to twenty-three. The most common symptoms were pelvic discomfort and irregular bleeding. The least constant symptom, in fact a very rare symptom, was expulsion of decidua. The bleeding which occurs in these cases

is probably a conservative process on the part of nature to prevent rupture of the thin Fallopian tube. The reason why the expulsion of the decidua is so rare is found in the fact that the decidua is not expelled until after the death of the ovum. The symptoms of pain, and sometimes shock, are caused by the escape of blood into the abdomen, usually through the abdominal end of the Fallopian tube; this occurs before the rupture. In these cases there is not sufficient blood to produce a considerable tumor; as the process is very gradual, severe shock often does not develop. The predominant symptoms are those of pain and irritation. When rupture of the tube occurs the predominant symptom is shock. Attention is called to the difficulties of diagnosis, and cases are narrated in which ovarian cysts with ruptured vein and pedicle, ovarian abscess and salpingitis, bicornate uterus, and intestine distended with feces have all simulated ectopic pregnancy. Uterine abortion is frequently diagnosed when ectopic gestation is present. Operative treatment alone is satisfactory, and the writer ligates both ends of the sac of the embryo and then enucleates the sac from the broad ligament, stitching together the tissues with a fine continuous suture. In old cases in which blood has been enclosed between the layers of the broad ligament, the cavity is packed with sterile gauze, the end of which is pushed through an opening into the vagina. Four deaths occurred in this series of cases, from purulent peritonitis, severe hemorrhage, secondary rupture, and exhaustion. All the fatal cases were operated upon late.

Extrauterine Pregnancy, with Uterine Fibromyoma.—TAYLOR (*Journal of Obstetrics of the British Empire*, June, 1906) reports a case of extrauterine pregnancy admitted to the hospital in severe shock from prolonged hemorrhage. The uterus was symmetrically enlarged, and it was thought that extrauterine and intrauterine pregnancy were present. The patient died and upon examination of the uterus it was found to be the site of a fibroma. Taylor reviews the literature of the subject, adding a bibliography.

GYNECOLOGY.

UNDER THE CHARGE OF

HENRY C. COE, M.D.,

OF NEW YORK.

Resistance of Tissues to Cancer.—MAASS (*Newyorker med. Wochenschrift*, Band xv, No. 3) has been led to believe from personal observation that the tissues of certain individuals resist the spread of cancer even when there is extensive cell-infiltration. The disease long remains localized, metastases either do not occur at all, or develop more slowly than the original neoplasm. That cancerous foci may long remain localized until they finally overcome the resistance of the surrounding tissues, or until younger and more active epithelial cells develop, is shown in the case of late recurrence after operation.

This individual idiosyncrasy may be utilized practically after operation by treating the cancerous foci which remain with caustics that are not sufficiently powerful to destroy the zone of healthy protective tissue. The writer believes that the good results sometimes observed by the injection of erysipelas toxin are due not so much to their specific action as to the fact that by the mild grade of inflammation which they induce increased tissue-resistance is favored.

This resistance may be augmented by systematic nourishment of the patient, proper environment, etc.

Best Method of Curing Cancer of the Uterus.—PFARMENSTUEL (*Berliner klin. Wochenschrift*, No. 27, 1905) believes that the ultimate solution of this question lies not so much in the removal of the intrapelvic lymph nodes as in the thorough extirpation of outlying foci of disease in the tissues adjacent to the neoplasm. If the broad ligaments are once involved a radical operation is only possible by the abdominal route, even though the immediate mortality must always be relatively great. This applies especially to cancer of the cervical canal, the best prognosis being in younger subjects, during pregnancy, or soon after the puerperium. Incipient epithelioma of the portio may be treated by vaginal hysterectomy, with extensive resection of the vagina and parametrium. The clinical character of the growth should determine to some extent the choice of operation, the vaginal route being applicable to cancer of the hard, ulcerating variety, while in the cauliflower form abdominal hysterectomy is indicated.

If after opening the abdomen the glands are found to be extensively diseased it is better to abandon the operation at once.

Relation of Uterine Disease to the Development of Cancer.—POLESE (*Rassegna ost. e gin.; Zentralblatt f. Gynäkologie*, No. 9, 1906) believes that prolonged irritation of the cervix uteri is an important etiological factor in the production of cancer. In thirty-four out of forty-eight cases this was clearly shown. The writer divides these cases into three classes: (1) Stenosis and dysmenorrhœa. (2) Chronic uterine catarrh. (3) Laceration of the cervix. In a number of cases microscopic examination showed a "sclerotic" condition of the uterine mucosa. The writer advises early "prophylactic" operation in every suspicious case.

Treatment of Pruritus Vulvæ.—LEREDDE (*Rev. prat. des mal. cutan., syphil., et vener.; Zentralblatt f. Gynäkologie*, No. 9, 1906) recommends highly the use of zinc paste, which he applies to the inner and the outer surfaces of the labia majora and minora, previously tamponing the vagina, the tampon being renewed after each urination. This treatment is not to be employed if actual lesions of the skin are present. Radiotherapy is a valuable adjunct in this connection.

Sarcoma of the Uterus.—PIQUAND (*Revue de Gyn. et de Chir. abdominale*, Band ix, No. 3) from an analysis of 416 cases collected from the literature concludes that the etiology of sarcoma of the uterus is practically unknown, neither Cohnheim's theory, heredity, trauma, inflammation, previous sterility, etc., being demonstrable etiological factors.

As regards the age of the patient, he found that sarcoma may develop

at puberty as well as after the climacteric. Contrary to cancer, the favorite site of sarcoma is in the body of the uterus, the latter being affected in 325 out of 393 cases in which the location of the neoplasm was stated. Metastases are most common in the lungs, next in the liver and intestines, the bloodvessels (rarely the lymph-vessels) being the channels of infection.

Changes of the Ovaries in Vesicular Mole.—WALLART (*Zeitschrift f. Geb. u. Gyn.*, Band lvi, Heft 3) from studies of the ovaries in connection with vesicular mole and chorion epithelioma arrives at the conclusion that in these conditions, as well as in normal pregnancy, the cells of these interna often undergo an epithelioid transformation, with accompanying cystic degeneration of the follicles, but that there is no accompanying change peculiar to the malignant condition of the uterus.

The Dangers of Atmokeusis and Zestokeusis.—PINCUS (*Zentralblatt f. Gynäkologie*, No. 13, 1906) affirms that if the operation is properly performed there is no more reason why it should be followed by stenosis, atresia, or obliteration of the uterine cavity than should a simple curettement.

He repeats the cautions so often given that an exact diagnosis must first be made and that the uterine cavity must be entirely empty, even of mucus and blood-clots. Atmokeusis should not follow curettement in women who are still in the childbearing period. Malignant disease must always be excluded. The writer still adheres to his original belief that total extirpation of the uterus should never be performed for hemorrhage alone until atmokeusis has been tried.

Bloodvessels of the Uterus.—KEIFFER (*Zentralblatt f. Gynäkologie*, No. 18, 1906) from careful anatomical studies arrives at the following conclusions: The branches which are given off from the uterine artery pursue a spiral course through the parenchyma of the uterus, each having a connective-tissue covering derived from that of the uterus. The arterioles gradually lose their three layers until the smallest are in direct contact with the uterine muscle and connective tissue. The latter form a dense net-work, the terminal vessels not presenting a visible lumen unless they are injected. In the gravid and inflamed uterus the net-work of vessels present the appearance of ampullae.

The veins have contractile coats and are in direct contact with the parenchyma. Keiffer concludes that the uterus is a true erectile organ, subject to marked increase in size under the influence of nervous and vasomotor influences.

Defect of Bladder and Urethra.—MACKENRODT (*Zentralblatt f. Gynäkologie*, No. 21, 1906) reports the case of a young girl with hypospadias of the urethra and neck of the bladder, who had submitted to several unsuccessful operations. The reporter cured the patient by adopting a different plan from the previous operators, suturing the neck of the bladder directly instead of utilizing flaps from the bladder, it being his observation that in such cases a rudimentary sphincter vesicae can nearly always be found.

In a second case the urethra and neck of the bladder sloughed away

in consequence of some lesions attending a difficult delivery. In this case also he was able to dissect out from a mass of cicatricial tissues the ends of the vesical sphincter and to unite them, afterward making a new urethra by a plastic operation, the result being entirely satisfactory. He lays stress upon the fact that however perfect may be the anatomical result after repair of the neck of the bladder by a plastic operation the innervation will be faulty unless the natural sphincter is restored.

Degeneration of Uterine Fibroids.—WINTER (*Zeitschrift f. Geb. u. Gyn.*, Band lvii) believes that sarcomatous degeneration occurs in 4 per cent. of all cases of fibromyoma and in 9 per cent. of the sub-mucous variety. Seventeen cases of necrosis occurred under his own observation, hence this must be regarded as a comparatively common form of degeneration, which should be suspected, especially when persistent hemorrhages, contractive pains, and symptoms of autoinfection follow abortion or labor at term.

Cystic degeneration the writer believes to be due to defective nourishment of the neoplasm, especially after the menopause, and is indicated clinically by profuse hemorrhages, with local and general disturbances.

Paralysis after Gynecological Operations.—GLOCKNER (*Zentralblatt f. Gynäkologie*, No. 21, 1906) reported at a meeting of the Leipzig Obstetrical Society the case of a patient, aged thirty-two years, who in the eighteenth day after normal convalescence from hysterectomy developed paresis of the lower limbs without loss of sensation. Since hysteria and a central lesion could be excluded the diagnosis of neuritis was made, although the reporter was unable to explain its origin or to find any records of a similar case.

Prof. Windscheid, to whom the patient had been referred for diagnosis and treatment, while he had no doubt that the case was one of neuritis, was equally unable to present a satisfactory explanation. He suggested as possible etiological factors the position of the patient during operation, injury to nerves, or anemia or toxemia.

Castration in Cancer of the Breast.—ROUBAND (Thèse de Lyon; Abstract in *Zentralblatt f. Gynäkologie*, No. 22, 1906) has collected fifty-one cases of inoperable cancer of the breast in which both ovaries were removed. In twenty-three the neoplasm either disappeared completely or diminished in size, but in only three was the cure permanent. In twenty-eight the result was entirely negative.

Helmitol in Postoperative Cystitis.—WITTHAUER (*Zentralblatt f. Gynäkologie*, No. 23, 1906) in view of the good results obtained in the treatment of cystitis (especially the postoperative type) with helmitol was led to administer it as a prophylactic whenever the use of the catheter was necessary. Fifteen grains are given twice daily, but the bladder is also irrigated with boric acid solution after each catheterization. 26 cases are reported in which the patient was catheterized from three to twelve days after operation, in only one of which did cystitis develop (A weak point in this report is the fact that irrigating the bladder was employed in addition to the use of helmitol.—H. C. C.)

OPHTHALMOLOGY.

 UNDER THE CHARGE OF

EDWARD JACKSON A.M., M.D.

OF DENVER, COLORADO,

AND

T. B. SCHNEIDEMAN, A.M., M.D.,

PROFESSOR OF DISEASES OF THE EYE IN THE PHILADELPHIA POLYCLINIC.

The Knife-needle Operation for Secondary Capsular Cataract.—JACKSON (*Arch. of Ophthalm.*, March and May, 1906) emphasizes the difficulties and dangers of operating through the clear cornea, as ordinarily recommended, and suggests the proper position of the point of entrance and technique of the operation, of which the following is the summary: The knife-needle should always enter through the vascular tissue of the limbus. It should be absolutely sharp, and used so as to cut and not tear. The operation should be done under strong illumination. The incisions must be made completely joining each other at or in the angle. Attention to these points will render the operation with the single knife-needle effective in almost all cases of secondary capsular cataract, and make it one of the safest operations of surgery.

Extraction of Cataract in the Capsule.—HENRY SMITH (*Arch. of Ophthalm.*, 1905, No. 6) describes his operation of extraction in the capsule. He makes a liberal-sized upper incision, inserting the knife at the sclerocorneal junction, and cuts into the cornea half-way between a normal pupil and the sclerocorneal junction. The speculum is then removed, and an assistant hooks up the upper lid on an ordinary large-sized strabismus hook and draws down the lower lid by placing the ball of his thumb on the skin of the face close to the eyelid. This is kept up until the operation is finished. It is of supreme importance to inhibit the action of the orbicularis by such pressure. He then places the curve of a strabismus hook over the cornea, about the junction of the lower with the middle third of the lens and a spoon, just above the upper lip of the wound. He presses the strabismus hook down, neither toward the wound nor from it, and does not alter its position until the lens is nearly out, all the time making slow, steady, and uninterrupted pressure and counterpressure. When the lens is more than half-way out, while keeping up the tension with the spoon in its original position, he shifts the strabismus hook forward and gently tilts the lens by getting the edge of it in the concavity of the strabismus hook. This must be done with great care and without the slightest roughness or jerk, to prevent the rupture of the capsule and the escape of the lens. An antiseptic pad and bandage are applied. After the lens and its capsule have come out there is to be no "fiddling," otherwise the vitreous is sure to escape. A table of 2616 cases of extraction in the capsule performed in the hospital from May, 1904, to May, 1905, shows first-class results in 99.27 per cent., second-class results in 0.38 per cent., and failures in 0.34 per cent. The first-class results include: Iritis,

0.3 per cent.; escape of the vitreous, 6.8 per cent.; capsule bursting, 8 per cent.; capsule left behind, 4.28 per cent. No written description can teach the operation satisfactorily; it requires to be seen. Pagenstecher has also extracted the lens in its capsule, but the procedure is entirely different from the Indian operation. In the former the lens is lifted out on a spoon.

The Treatment of After-cataract.—SMITH (*Arch. of Ophthalm.*, March and May, 1906) strongly urges that the best operation for cataract and the procedure of the near future is extraction within the capsule; when this has not been done but the cataract has been extracted in the ordinary manner, leaving the capsule behind, he recommends removing the membrane in whole or in part by making an iridectomy sized wound at the sclerocorneal junction above; doing an iridectomy, if it has not already been done; introducing an ordinary iris forceps, a little stouter than usual, somewhat beyond the centre of the pupil; allowing the blades to open wide; driving the point through the after-cataract wide apart; close the forceps tightly, and bringing out the offending body. Thus treated the capsule usually comes out in its entirety; and if not in its entirety, it comes out more efficiently than by any needling. There may be an escape of a bead of vitreous, which is of no importance. The escape of vitreous should not occur if an assistant keeps the lower lid well drawn down by placing his thumb on the face below it. In this procedure the object of removing the offending body is commonly accomplished, and the results are eminently satisfactory.

DISEASES OF THE LARYNX AND CONTIGUOUS STRUCTURES.

UNDER THE CHARGE OF
J. SOLIS-COHEN, M.D.,
OF PHILADELPHIA.

Fibrosarcoma of the Thyrohyoid Membrane.—RENSHAW (*Journal of Laryngology, Rhinology, and Otology*, April, 1906) reports a case of fibrosarcoma arising from the thyrohyoid membrane. In a weaver, twenty-nine years of age, a growth had steadily developed, during a course of two years, over the thyrohyoid space and upper part of the thyroid cartilage. The voice had been hoarse for ten months and there had been some difficulty in swallowing, while lately there had been considerable pain running up to the left ear.

A smooth swelling in the middle line extended from immediately below the hyoid to about half-way down the thyroid cartilage, spreading on each side almost to the posterior margin, and appeared to be tightly bound down to the thyroid cartilage. It was firm and elastic to the touch, but there was no tenderness upon pressure.

Laryngoscopic inspection showed the laryngeal mucous membrane to be congested, the entire anterior wall to be displaced slightly back-

ward, while there was also a slight bulging observed in the middle line and a little above the anterior commissure.

The tumor was removed by a median incision and was found to be definitely encapsuled under the thyrohyoid muscle. The patient made an uninterrupted recovery with relief of his symptom. Renshaw attributed these symptoms to pressure of the growth under the cervical fascia forcing the larynx backward.

Congenital Lipoma of the Buccal Pouch.—WYLIE (*Journal of Laryngology, Rhinology, and Otology*, January, 1906) recently removed from a female patient, aged fifty, a congenital lipoma of the buccal pouch which had formed a firm, smooth projection into the mouth, and had caused but slight inconvenience. The structure was adipose tissue with an ill-defined fibrous capsule. It represented an hypertrophied vestige of the "infant's sucking pad."

Multiple Telangiectasis of the Skin and of the Mucous Membranes of the Nose and of the Mouth.—KELLY (*Revue hebdomadaire de Laryngologie, d'Otologie, et de Rhinologie*, April 28, 1906) reports two instances in sisters, and refers to eight other cases that he has found in literature which he has studied in connection. These cases usually terminate fatally by hemorrhage or by exhaustion due to the hemorrhages.

Multiple Angiomas of the Throat.—DE NAVRATIL (*Archives Internationales de Laryngologie, d'Otologie, et de Rhinologie*, Mai-Juin, 1906) alludes to a patient he saw in Dr. Dollinger's clinic with angiomas upon the left tonsil, palatine folds, and the conjunctiva, associated with a large erectile tumor upon the left side of the neck. During narcosis for extirpation of the neoplasm, asphyxia supervened, which was attributed by the operator to the angiomas in the palate and throat which became hyperemic during the arterial hypertension, and dilated sufficiently to obstruct the respiratory passages. Tracheotomy was immediately performed and the operation then completed. Three days later the cannula was removed, and the patient left the clinic soon after.

Œdema of the Pharynx.—SCHADLE (*The Laryngoscope*, February, 1906) reports a case in which unilateral œdema of the pharynx occurred in sequence from an infectious nephritis brought on by an attack of quinsy of the same side.

Soft Fibroma in the Lateral Wall of the Pharynx.—JOHN MCCOY (*The Laryngoscope*, February, 1906) reports a cystic looking growth as large as a small pear which had hung free by a small pedicle in the cavity of the pharynx of a man, thirty-seven years of age. The only symptoms complained of had been that of a lump in the throat for some six months.

Hypertrophic Laryngeal Tuberculosis.—RHODES (*The Laryngoscope*, January, 1906) reports a case of hypertrophic laryngeal tuberculosis in a man, thirty-six years of age, the subject of tuberculous disease in the knee-joint. The diagnosis was confirmed by the detection of giant cells and numerous tubercle bacilli in a section of the right ventricular band removed for purposes of microscopic study.

DERMATOLOGY.

UNDER THE CHARGE OF

LOUIS A. DUHRING, M.D.,

PROFESSOR OF DERMATOLOGY IN THE UNIVERSITY OF PENNSYLVANIA,

AND

MILTON B. HARTZELL, M.D.

INSTRUCTOR IN DERMATOLOGY IN THE UNIVERSITY OF PENNSYLVANIA.

A Fatal Case of Erythema Multiforme Exudativum.—WELANDER (*Archiv f. Dermatologie und Syphilis*, Band lxxvii, Heft 2) under the above caption reports the following case: A young man, aged twenty-three years, who had multiple initial lesions of syphilis upon the penis, was ordered daily inunctions of mercurial ointment, and a hypodermic injection of mercurial oil every five days. At the end of two weeks a conjunctivitis appeared with an erythematous eruption situated upon the backs of the hands and upon the knees, accompanied by mild fever, chills, and malaise. After some days these symptoms began to disappear, but soon a new attack with severe fever and extensive eruption, with swelling and redness of the mucous membrane of the mouth, appeared. The buccal mucous membrane became exoriated, was covered with a grayish-yellow exudate, and was very painful. The fever increased in severity without any new skin symptoms, a nephritis and symptoms referable to the respiratory organs appeared, and the patient finally died with symptoms of general infection. [It seems to us the possibility of this case being one of mercurial poisoning is not excluded.—M. B. H.]

Experiments upon the Action of Light in Hydroa Estivalis.—EHRMANN (*Archiv f. Dermatologie und Syphilis*, Band lxxvii, Heft 2), from a number of experiments made with the Finsen apparatus upon a man the subject of hydroa estivalis, draws the following conclusions:

The summer eruption of Hutchinson or the hydroa estivalis of Bazin is due to a familial, probably hereditary, idiosyncrasy of the skin against the action of the actinic rays of light, and is analogous to epidermolysis bullosa congenita hereditaria, in which there is a hypersensitiveness against mechanical irritation; with this difference, however, that in the latter a diminution of the idiosyncrasy occurs with advancing years and tolerance does not occur as in summer eruption. As being more appropriate, Ehrmann proposes to call the affection epidermolysis or dermatolysis photactinica congenita.

Ringworm with Unusual Localization.—RILLE (*Dermatologische Zeitschrift*, Band xii, Heft 11) at the seventy-seventh meeting of the Deutsch Naturforscher und Aerzte presented a patient with ringworm in a most unusual situation. A man, forty years old, had had for twenty years a diffuse reddening, scaling, and infiltration of the forearms, backs of the hands, and palms, an abundance of fungus elements being demonstrable in the deeper layers of the epidermis. There were also a characteristic ringworm of the finger-nails, a trichophytic blepharitis, and reddening and scaling of the external ear. The skin about the angles

of the mouth was red and scaling, the adjoining mucous membrane and red of the lips were bluish white and thickened. On the borders of the hard and soft palate were irregularly circumscribed macules and epithelial defects, with bluish-white opacities. On the back of the tongue, in the median line, especially the posterior half, were numerous pinhead to hemp-seed-sized, yellowish-red and dark-red, solid-feeling nodules, some of which showed shallow ulcers. A moderate amount of the trichophyton fungus was demonstrable in the lesions in the mouth. The affection of the mouth had lasted about eight years.

Static Electricity in the Treatment of Diseases of the Skin.—SUCHIE (*Dermatologische Zeitschrift*, Band xii) reports a number of cases of chronic eczema, sarcoma, epithelioma, and some parasitic dermatoses in which he has had most successful results from the use of static electricity. Of special interest is the report of a case of mycosis fungoides of three years' duration, which after the failure of all other methods of treatment was apparently completely cured by this agent. The author regards static electricity as of extraordinary value in the treatment of many diseases of the skin, but it is necessary to use strong currents. Undesirable effects are never observed after its employment, even when the current is allowed to act for long periods of time.

A Peculiar Case of Circumscribed Seborrhœa.—MARSCHALKO (*Dermatologische Zeitschrift*, Band xii, Heft 11) reports a peculiar case of profuse circumscribed secretion of sebum occurring in a woman, aged thirty-three years. About eleven months before coming under the author's observation she had received a severe blow with a club in the supra-orbital region, which resulted in a purulent inflammation and was followed by anesthesia in the left supraorbital region. Some time afterward she began to suffer from increasingly severe neuralgic pains, for which she underwent a surgical operation, in which some fragments of bone were removed. The pain continued, however, and gradually a profuse greasy secretion made its appearance upon the injured side. When first seen the patient presented a most peculiar appearance; the left frontal and temporal regions were covered by a sharply circumscribed, dirty brownish-yellow, thick mass the surface of which was divided into polygonal areas as in ichthyosis sebacea. The patient experienced severe pain from the slightest touch, and it was with the greatest difficulty that a portion of the mass, which was slightly adherent, was removed. The skin beneath the crust was somewhat hyperemic, and from the dilated follicles minute drops of half-fluid white fat projected. The secretion was confined to a region corresponding very exactly to the distribution of the supraorbital nerve. In this region there was decided hyperalgesia with hyperthermalgesia. Treatment directed against the abnormal fat-secretion was without result. A second operation was performed on account of the increasing severity of the neuralgia; this was followed by a diminution of the pain and secretion of fat.

PATHOLOGY AND BACTERIOLOGY.

UNDER THE CHARGE OF

WARFIELD T. LONGCOPE, M.D.,

DIRECTOR OF THE AYER CLINICAL LABORATORY, PENNSYLVANIA HOSPITAL.

ASSISTED BY

G. CANBY ROBINSON, M.D.

RESIDENT PATHOLOGIST, PENNSYLVANIA HOSPITAL, PHILADELPHIA.

Pathological Histology of Congenital Syphilis in Relation to the Spirocheta Pallida. LEVADITI (*Ann. de l'Inst. Pasteur*, 1906, t. xx, p. 41) has been able to demonstrate *Spirocheta pallida*, often in great numbers, in the organs of six fetuses from syphilitic mothers. By staining in bulk with silver nitrate small bits of the tissues hardened in formalin the organism may be seen in sections, and their distribution studied. They were found in decreasing numbers in the liver, lung, suprarenal glands, and skin, but always predominated in any organ which showed pathological change. In the lungs of a child who died of pneumonia alba they were very numerous. The parasites seemed to have a marked preference for the epithelial cells in which they seemed to lie. Besides, they invaded the vessel walls. They also seemed to undergo phagocytosis, for frequently the parasites were found in the large macrophages. The author believes that for this reason they are not common in the spleen. The maceration of the fetus *in utero* is thought to depend upon some autolytic action which is set up after death from an intense infection by *Spirocheta pallida*.

Immunization against Swine Plague by the Help of Bacterial Extracts (Aggressins). BAIL and others have shown that exudates produced in the body by the injections of certain bacteria have the property of enhancing the virulence of these same bacteria when injected with them into other animals, though if injected alone they are harmless. Wasserman and Citron have been able to obtain identical substances, so-called aggressins, from aqueous extracts of bacteria. Citron (*Zeit. f. Hyg. und Infekt.*, 1906, Band lii, p. 238) by injecting guinea-pigs and rabbits with 2 to 4 c.c. of these aggressin substances poured from exudates produced by the bacillus of swine plague or from serous or aqueous extracts of the bacillus itself has been able to immunize the animals against many times the fatal dose of a culture of swine plague. He finds, moreover, that the serum of immunized rabbits has a very definite quantitative protective power for guinea-pigs and mice against injections of fatal doses of swine plague.

Toxin of Fatigue. WOLF-EISSNER (*Centr. f. Bakt.*, 1906, Bd. xl, p. 631). Weichardt in 1904 advanced the theory that manifestations of fatigue were produced by a toxin generated in the overexerted organism which is similar to diphtheria, ricin, abrin, and tetanus toxins. For this fatigue toxin an antitoxin could be produced which *in vitro* and *in vivo* would neutralize it.

Wolf-Eisner in discussing this question puts forth the idea that athletic training may produce an immunity to this toxin, and thus allow the trained athlete to perform much more work than the untrained.

A fatigue toxin was obtained from animals fatigued by mechanical and experimental means which when inoculated into other animals in small doses produced symptoms of fatigue: drowsiness and a lessening of activity. The toxin is easily absorbed from mucous surfaces, and so it was administered in the experiments by spreading it on the conjunctiva. Death often follows the administration. A genuine antitoxic immunity was produced by the non-fatal doses.

The fatigue toxin was not found in the blood of animals, but in the muscles, while the blood contained the antitoxin. The toxin is not dialysable, while the antitoxin can be dialysed with ease. This difference the author thinks accounts for the fact that the antitoxin is found in the blood while the toxin is not.

The fatigue toxins have the properties of colloidal, high-molecular, albuminous bodies. The author thinks, however, that this may be due to the fact that the toxins cannot be separated from the albuminous bodies and so appear to be very similar to them.

It has been found that the use of the antitoxin of one animal is harmless to an animal of another species. The author believes that certain conditions, such as are found in neurasthenia, may be due to the lack of antitoxin production. By the breaking down of albumins by electrolysis, toxins can be formed which can also produce an antitoxin. The fatigue toxin is probably of this nature.

The Toxicological Constitution of *Amanita Phalloides*.—W. W. FORD (*Jour. of Exp. Med.*, 1906, vol. viii, p. 437) has shown in earlier papers that extracts of the poisonous mushroom *Amanita phalloides* contains a hemolytic principle, phallin, previously described by Kober in 1891, which acts directly upon red blood corpuscles without the intermediation of serum, and is destroyed only at a temperature of 65° or higher. The hemolytic principle according to the author should be placed provisionally with the bacterial hemolysins. The extracts themselves are deadly poison to animals which, however, may be immunized against fatal doses. The immune serum is antihemolytic in a high degree.

This paper deals with the separation of a second substance from the hemolytic factor. Certain of the effects produced upon animals, such as hemoglobinuria and pigmentation of the spleen, could be accounted for by the action of phallin, but it was discovered that if the phallin was removed by treating the extract with red blood corpuscles the extract was still highly toxic. Heating to 65° destroys the hemolytic action without injury to the toxic factor. Extracts treated with emulsions of brain tissue remain unaffected. Finally, animals immunized with a hemolytic-free extract produce a serum which is not antihemolytic but antitoxic.

The author concludes that the extracts of the poisonous mushroom contain at least two substances: phallin, a thermolabile substance, which is the hemolytic principle, and in animals produces the subcutaneous oedema, hemoglobinuria, and pigmentation of the spleen; and a second body, termed by him amanito-toxin, which is thermostable, and in animals gives rise to hemorrhage, necrosis, and fatty degeneration of the organs.

The Path of Infection or Tubercle Bacilli from the Mouth and Trachea to the Lung, with Special Reference to the Condition in Children.—BEITZKE (*Virch. Arch.*, 1906, Bd. clxxxiv, p. 1) to determine the relationship between the various systems of lymphatic channels in the neck and bronchial regions has injected the lymphatics, starting at various situations, in cadavers of newborn children. By this means he has determined that fluid injected into the chain of great, deep, cervical lymph glands does not reach the thoracic vessel. There are no communicating branches between the two systems. It is also impossible to inject through the recurrent chain of superficial lymph glands the deep glands. The separation lies at the level of the lower edge of the thyroid gland. On the other hand, injections through the group of cervical lymph glands lateral to the sternocleidomastoid muscle flow into that part of the deep cervical chain lying underneath, though the reverse is not true. The latter chain ends in a gland directly above the omohyoid, and occasionally in a gland beneath this muscle. This gland may be injected through the tracheobronchial lymph glands partly direct, partly by means of the recurrent chain of glands. Either anteriorly or posteriorly to the vena anonyma sinistra the lymphatics of both sides anastomose. Further experiments carried out upon dogs in which India ink was rubbed upon the tonsils, etc., showed that there was only one method of transmission of these particles from the cervical lymphatics to the lung—namely, through the blood stream. A study of the lymphatic tuberculosis in forty-five tuberculous children who came to autopsy demonstrated that this method, though practical, is not necessary. Infection of the lungs and of the bronchial lymph glands is much more common by aspiration of tubercle bacilli into the bronchial tree. An ascending cervical tuberculosis frequently occurs independently. The aspirated bacilli may be held in the air; they may also be acquired through the mouth when they are taken with infected food.

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DR. A. O. J. KELLY, 1911 Pine Street, Philadelphia, U. S. A.

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SPECIAL ARTICLE.

SOME EXPERIENCE WITH THE SIMPLER METHODS OF PSYCHOTHERAPY AND RE-EDUCATION.¹

BY LEWELLYS F. BARKER, M.D.,

PROFESSOR OF MEDICINE, JOHNS HOPKINS UNIVERSITY, BALTIMORE, MARYLAND.

INTRODUCTION. In 1904, while in Paris, I was much impressed with what I saw in the so-called Pinel ward of the Salpêtrière. In this ward of thirty beds, more or less, Prof. Dejerine was treating the psychoneuroses, especially hysteria and neurasthenia, by isolation and psychotherapy. Each bed was surrounded by drawn curtains, so that the occupant did not see or communicate with her neighbors in the ward. All letters and visitors from outside were cut off; the patients saw only the physicians and the nurses. At the physician's rounds the curtains were opened, the patient was told of her nervous condition, the cause of it was explained, the improvement noted was mentioned, and she was informed that she would get well. The neurasthenic women received in addition an excess of food; otherwise they rested in bed, were isolated, and treated "psychotherapeutically" much as were the hysterical. Drugs were but seldom employed; hypnotism was not used. The results attained were very striking. Paralyzes, contractures, anorexias, nervous crises, gastropathies, etc., many of them having lasted for months or years, disappeared in a few days, weeks, or months under the influence of this simple treatment. The poor people of Paris benefited by their sojourn in the Pinel ward practically as much as wealthy people similarly affected improve in the best conditioned sanatoria.

¹ Read at the meeting of the Association of American Physicians, Washington, D. C., May 15 and 16, 1906.

These observations, together with the perusal of a book published by two of Dejerine's former assistants¹ and of another volume, that of Dubois,² of Berne, an author to whom Dejerine also acknowledges indebtedness, made me determine to try in practice, myself, at the first opportunity, the methods referred to. During the past year in the medical service at the Johns Hopkins Hospital, this opportunity has come to me, and the results that have been obtained, though systematically combining conscious psychotherapy with rest in bed, isolation, and other measures, have been so satisfactory in a certain group of cases that I have thought a brief report on the matter might be interesting to this Association.³

HISTORICAL NOTE. It is not my purpose to review at this time the history of psychotherapy at any length. A word or two with reference to the development of the subject will suffice. Consciously or unconsciously psychotherapy has been practised by physicians from the earliest times. Suggestion in various forms has been efficacious in the cure of functional disease from the period of Hippocrates until now. In ancient times the religious teachers developed methods of conscious psychotherapy, by persuasion, to aid those who consulted them in banishing false ideas, scruples, or fears. Suggestion by pharmacotherapy has had at all times and still has great vogue, though often both physician and patient are unconscious of the action by suggestion of the remedy. The chemical substances that have come and gone, each in its time potent in curing the symptoms of disease, are recorded in the dusty materia medica of our ancestors; and even the pharmacopœia of to-day contains preparations which owe their marvellous efficacy in many instances to the suggestive effects of their administration, to the faith that the patient has in them or in the doctor who administers them, rather than to the direct physical and chemical changes they produce on the cells and fluids of the body.

At all times, too, among the laity, varieties of miracle cures, or of cure by occult means, have been more or less popular. For centuries the royal touch brought healing; again it was the relic of a saint; astrologers and alchemists had their turn. Since Paracelsus we have known the magnetic healers. Out of magnetism came mesmerism, and following upon Mesmer's influence our knowledge of hypnotism was born. Hypnotism, hailed at first as a great healing measure, is now in disrepute as a therapeutic agent, but it is to the study of hypnotism, especially by the Nancy school since 1887, that the development of modern non-hypnotic psychotherapy is largely due. The treatment of hysteria to-day is carried out

¹ J. Camus et P. Pagniez, *Isolément et Psychothérapie. Traitement de l'hystérie et de la neurasthénie pratiques de la ré-éducation morale et physique*, Paris, 1904, 1-407.

² *The Psychic Treatment of Nervous Disorders. The Psychoneuroses and their Moral Treatment*. Translated and edited by Smith Ely Jelliffe and William A. White, N. Y., 1905.

³ Byrom Bramwell's successes in Edinburgh reported in his clinical studies are of a similar nature.

along lines almost entirely unknown to medical men of fifty years ago. The best psychotherapy of our time is largely one of education, explanation, and persuasion rather than of suggestion, but the significance of this persuasion-therapy would scarcely have been grasped had it not been for the thorough study of suggestion-therapy.¹

In this country psychotherapy got an early start, thanks especially to the keen insight of S. Weir Mitchell, and while it has undergone a marked development since he introduced his cure by rest, isolation, and overfeeding, still these three factors are to-day of the highest importance as adjuvants to psychic treatment. That American neurologists have kept in touch with advances in psychotherapy and have used and are using its methods intelligently is clear from the admirable articles in Solis Cohen's² *System of Physiologic Therapeutics*, and the works of G. M. Beard, C. K. Mills, J. J. Putnam, C. L. Dana, Russel Sturgis, Hamilton Osgood, Morton Prince, H. T. Patrick, Boris Sidis, Frederick Peterson, Wharton Sinkler, and many others.

The bibliography of psychotherapy is large. The works cited above contain many references to original sources. Of other books especially useful for consultation may be mentioned Bernheim's³ volume; P. Janet's⁴ writings; Contet's⁵ brochure; and Loewenfeld's text-book.⁶ It is interesting to find how many of the newest views are foreshadowed in Weir Mitchell's *Fat and Blood and How to Make Them*, the first edition of which appeared in 1877.

PERSONAL EXPERIENCES. In my own work and that of the medical and nursing staff with which I have been co-operating only the simplest methods of psychotherapy and re-education have been employed. It has seemed to us desirable to gain experience with the simplest methods first before resorting to the more complex and difficult procedures. Accordingly persuasion, isolation, and occupation have been our main psychotherapeutic weapons. We resort to hypnotism only for special purposes; it has not been employed in any of the cases reported in this paper. Freud's "psychoanalytic" or "cathartic" method, Jung and Ilberg's analyses, Janet's "suppression and substitution method" and Sollier's "organic method" I class among the more difficult procedures, possibly advantageous in cases which resist the simpler measures; with them

¹ A. Moll. Was hat uns der Hypnotismus gelehrt? Med. Klin., Berl., 1905, i, 1215, 1216, 1279, 1303.

² See S. Solis Cohen, *A System of Physiologic Therapeutics*, vol. xi, pp. 232, 238, 242, 243, and 248, and especially the article by F. X. Dercum, on Psychotherapy, in this System.

³ Hypnotisme, suggestion, psychothérapie avec considerations nouvelles sur l'hystérie. Second edition, Paris, 1904, pp. 1-690.

⁴ Traitement psychologique de l'hystérie. Traité de Thérap. de Robin, fasc. xv, p. 184. L'état mental des hystériques, Paris, 1900; Névroses et idées fixes. Second edition, Paris, 1904. Les obsessions et la psychasthénie, Paris, 1903.

⁵ Les méthodes de ré-éducation en thérapeutique (ré-éducation, psychique, motrice sensorielle et organique), Paris, 1905.

⁶ Loewenfeld (L.), *Lehrbuch der gesamten Psychotherapie*, Wiesbaden, 1897.

I have had, as yet, no personal experience. What has surprised us most in the hospital in which I work is the remarkable, at times "wonderful," efficacy of the simplest measures—of psychotherapeutic methods which are within the reach of all hospital physicians and certainly of many private practitioners. The patients who respond most promptly to psychotherapy are the psychoneurotics, sufferers from neurasthenia, hysteria, psychasthenia, etc. Many of their symptoms disappear rapidly under moral treatment. Among the hysterical, the paralyses, the contractures, the anesthetics, and the pains are amenable. Among the neurasthenics, psychic treatment aids enormously the somatic measures in combating the sensation of fatigue, the circulatory disturbances, the insomnias, the digestive troubles, the sexual weaknesses, and the abnormal mental states. Among the broader group of psychasthenics the feelings of incompleteness (voluntary, intellectual, and emotinal), the psychic insufficiencies (aboulias, amnesias, phobias, etc.), the physiological insufficiencies (nervous, digestive, circulatory, genital) yield to treatment by psychotherapy more quickly than to any other therapeutic measure. Even in the obsessed (I think it might be better to call them the "possessed") our greatest hope for cure lies in psychic means.

It is not in the so-called functional diseases alone, however, that psychotherapy and re-education are of value. We are gradually learning the usefulness of these measures too in organic diseases, chiefly of course in combating the functional disturbances associated therewith; but in tabes, in aphasia, and other disturbances of speech, even in circulatory and respiratory diseases, these methods find a place.

Time will not permit me to discuss the exact distinctions between "suggestion" on the one hand and "persuasion" on the other. The terms are used loosely by some writers, different men expressing entirely different conceptions by the same words. The main difference, as I understand it, lies in the relation to the higher psychic functions. In suggestion these higher functions are not utilized, or, if affected, they are inhibited. In persuasion, on the contrary, it is the higher psychic functions which are called into action; the mind is won over by the presentation of suitable reasons and not by the exertion of authority, force, or fear.

I realize how hard it is in practice sharply to separate suggestion from persuasion. I am under no illusion that the persuasion-therapy we have been using is pure. Indeed, it must be recognized that a large part of our good results are actually due to the adjuvant methods employed and to the suggestion in them, to the reputation of a large hospital, and to the discipline which prevails. Whereas with pharmacotherapy, climatotherapy, hydrotherapy, etc., it is difficult to say how much of the result gained is due to the physical action of drug, of climate, or of water, and how much to psychic influence;

so, now that psychotherapy is in vogue and we are exerting psychic influences consciously, we need to exercise great care lest we attribute to our psychic treatment some effect which really results from a physical or chemical adjuvant. Truly here, as in so many parts of medicine, experience is fallacious and judgment difficult. But those of us who have watched the treatment of these cases with the same adjuvants, the same environment, and the same merely suggestive influences, but without the conscious application of psychotherapy in the form of persuasion, isolation, and re-education, are convinced of the striking way in which the results differ when psychotherapy is consciously and systematically employed.

We have had under treatment since October 1, 1905, a large number of cases—more than eighty—in which psychotherapeutic measures have been our mainstay. I shall record here a few of them only as illustrations. The patients who could afford to pay for private rooms and special nurses have had certain advantages which we could not give to patients in the public wards. The cures in the larger wards, have, however, been frequently as striking as those made in the separate rooms of the private pavilions. It has been found helpful to screen off the bed of a psychoneurotic patient in the public ward.

ILLUSTRATIVE CASES CURED OR MARKEDLY BENEFITED.

CASE I.—*Hysterical attacks; headaches; "fainting spells" with rigidity; no attacks after one week of treatment.*

P. D., school-girl, aged twelve years, was admitted to the public ward March 22, 1906, complaining of "fainting spells."

Family History. The mother was always "nervous" and the father's grandmother had had fainting spells similar to those of which the patient complains; otherwise negative.

Present Illness. The girl has been healthy, except for nervousness; was always easily frightened; at times would fall and become rigid. Except for whooping-cough, measles, and mumps she has had no infectious diseases. She has suffered much from headaches all her life. Seven months ago spectacles were ordered, but the headaches have been worse since and she has complained of earache and nervous toothache. She says that she catches cold easily. After the fainting spells of which she complains she has noticed an increased amount of urine.

In June, 1905, she fell from a pair of steps and became unconscious. She was picked up and brought to her mother and regained consciousness after water had been dashed in her face; she sustained no injury at the time and did not bite her tongue. She had no more attacks during the summer, but noticed that she was excitable when playing with other children. In the autumn the school physi-

cian advised her remaining at home, but she began to go to school again, and remained in school until February. She had several attacks of unconsciousness in school. The attacks were more frequent in the afternoon. The mother's description of a typical severe attack is as follows: "Before it begins the child complains of feeling badly, says she is weak all over, the fingers of the left hand and afterward those of the right hand begin to draw up, the legs bend on the abdomen, a cloud comes over her eyes, her tongue is paralyzed. She is unable to speak, then she becomes rigid, closes her eyes, does not recognize anyone. The unconsciousness lasts from ten minutes to half an hour. There is never involuntary micturition or defecation, the tongue has never been bitten, and she never injures herself on falling." She has had milder attacks in which consciousness is not lost, but her hands twitch, and she feels as if she were going to faint. Globus has been present.

Physical Examination. Thorax and abdomen are negative except for reduplication and accentuation of the pulmonic second sound. Knee-jerks are present, but not exaggerated; plantar reflex normal. Dermatographia fairly well-marked. Blood normal.

On April 4 a note was made that the patient had had two attacks since admission; the first was on March 28, beginning at 6.35 A.M. and lasting twenty to twenty-five minutes. The body was held rigidly, hands and feet cold, fingers drawn up, claw-like, feet extended, respirations regular, apparent unconsciousness, quivering eyelids. When ammonia was spoken of she suddenly revived. Next day another attack between 1 and 2 P.M. Patient was found lying limp, eyes closed, crying for angels to come and take her to heaven; asked that her coffin be brought; flushed face, an occasional tear. Obeyed orders to perform certain movements. A screen was placed around the patient's bed and she was left entirely alone. She resented isolation and finally agreed not to have "any more spells."

Dr. Mills examined the eyes and reported hyperopia.

Patient was discharged April 13, having been free from attacks since March 29. The treatment consisted of rest in bed, isolation, discipline, and persuasion.

CASE II.—Aerophagia; chronic constipation; hot flushes; symptoms disappeared after two weeks of treatment; discharged at the end of our month apparently well.

M. S., aged thirty-two years, housemaid, married, was admitted to public ward G., January 31, 1906, complaining of nervousness and belching.

Her father had been alcoholic and died of tuberculosis at fifty-three. Family history otherwise negative.

Personal History. Healthy as a child, always cheerful. Has had frontal headaches since 1897, when some womb trouble, she says, began. Suffered from constipation for fifteen years, and has

been in the habit of taking drugs to relieve it. She has been treated in the gynecological ward in 1904, on account of adherent tubes and ovaries and retroflexion of the uterus. In December of that year the uterus, ovaries, and tubes were removed. The patient has lived a quiet life, with but little amusement and few associates. In 1904 she separated from her husband owing to his bad conduct, and her worry and gloom increased. She was afraid to be in the dark. In November of the same year she complained of epigastric pain, headache, chilly feelings; at times was afraid of losing her mind. In September, 1903, she had much pain in the back, nervousness, sleeplessness, and a feeling as though there were a lump in her epigastrium. She received bromides and valerian, and improved somewhat. After her gynecological operation in 1904 her symptoms increased in intensity, and she began to notice marked belching and this has steadily grown worse. Patient gasps for breath at the same time. The limbs occasionally stiffen and she sweats. A death in her family last year made her symptoms worse. She has had no convulsions and no hallucinations.

Examination. Eyes are prominent; von Graefe's sign negative; thyroid not enlarged; hands moist and clammy; fine rapid tremor of the fingers; pulse 84. Heart and lungs negative. Abdomen negative except for scar of operation wound. Knee-jerks active on both sides. Blood normal.

A careful examination of the cutaneous sensation was made, and no objective disturbances found.

Treatment and Progress. Patient was put to bed, told that her troubles were nervous and that we believed that she would get well. She swallows air and gulps it up again (erophagia). Her diet consisted of milk for six days, after which she received the full ward diet. She recovered rapidly.

February 13. She is sleeping well and there is no more belching. The bowels are moving without the use of laxatives. She still has hot flushes.

On February 28 the patient was discharged free from symptoms, having gained seven and a half pounds in weight.

CASE III.—Hysterical crises; choreiform movements; hemianesthesia; tremor; rapid improvement.

A. G., white, aged fifteen years, single, was admitted to public ward G., January 8, 1906, complaining of "St. Vitus' dance."

Family history negative except for tuberculosis on mother's side.

Personal History. Patient has had measles, whooping-cough, and three years ago a severe attack of tonsillitis; one year ago had typhoid, three months in bed; has never had rheumatism nor anything like chorea before the present attack. She had always been a nervous girl; weight 125 pounds.

Present Illness. The trouble began on Christmas Eve. Her mother thinks it was caused by fright. The girl's aunt came to

the house in a delirious or hysterical state, throwing herself about in a wild way and frightening the patient. The mother noticed that the child had a peculiar staring look in her face and twitched a little. Since then her hands, face, arms, and legs have been the seat of involuntary and uncontrollable movements. At times the patient screams and kicks. Appetite good, bowels regular, speech somewhat disturbed, sometimes talking so that she cannot be understood. Blood: red blood corpuscles, 4,968,000; white blood corpuscles, 10,500; hemoglobin, 82.9 per cent.

Examination. She seems intelligent; answers questions with difficulty, seeming to have trouble when speaking; occasional twitch of the angle of the mouth. Head drawn to one side from contraction of neck. Choreiform movements in arms and legs and slightly in trunk. Pupils widely dilated, equal, react to light; no nystagmus. Thorax and abdomen negative except for blowing systolic murmur in second and third left intercostal spaces. Knee kicks active.

On the day after admission the choreiform movements had disappeared except in the tongue. Eye-grounds negative (Dr. Bordley).

Objective examination of sensation difficult. Complete anesthesia for pain on the right side of body was, however, obvious in the right face, arm, trunk, and in the right lower extremity below the knee.

No catatonic rigidity, verbigeration, or stereotyped movements. Marked tremor of upper eyelids.

Treatment. Rest in bed; milk diet for a week, followed by full ward diet; persuasion. The anesthetics rapidly disappeared, as did the choreiform movements. The patient remained, however, somewhat apathetic. Her appetite became good, she slept well, and was discharged practically free from symptoms on February 6.

CASE IV.—*Hysterical crises; globus; dermatographia; contracted visual fields; rapid improvement.*

D. E., sewing girl, aged seventeen years, was admitted to the public ward January 3, 1906, complaining of nervousness and gurgling in the throat.

Family history negative.

Patient has had much headache since childhood; some shortness of breath during last two months. Says she has noticed blood on pillow in the morning and that she has had night-sweats. Bowels constipated. Patient has always been nervous, and prefers quiet and solemn affairs, such as funerals; reads much; never goes to places of amusement. Menstruation has been painful and somewhat irregular. Sews from 7 A.M. to 6 P.M., with half-hour for lunch; drinks six to seven cups of coffee per day.

* Last November, two days after seeing a girl have an hysterical convulsion, patient had a "spell;" suffered severe cramps while at work; later on had headache; was unable to move or speak, though

conscious of her surroundings. Later became unconscious and clenched her hands, cutting the palms with her nails. Moved her arms about hysterically and resisted those who helped her. After fifteen minutes consciousness returned, followed by a shaking chill. Someone gave her a dose of valerian, after which she again became unconscious, waved her arms about, talked continuously about the work and happenings of the morning. This attack lasted for two hours. A week later she had a second attack similar to the first. In all she has had seven. She has noticed a lump in her neck, but it has disappeared. The blood shows moderate hemoglobinemia.

Examination. Pupils dilated. Thyroid possibly slightly enlarged; no bruit; no thrill. No exophthalmos. Thorax and abdomen negative. Furuncle on medial side of right knee. Marked dermatographia. Knee-jerks active. Plantar and abdominal reflexes very active. No objective disturbance of cutaneous sensation. Examination of eyes (Dr. Borlley): some myopic astigmatism with slight divergent squint of left eye; disks normal; visual fields show marked contraction for colors.

Treatment. Patient was told that her trouble was a nervous one from which she would recover. She was put to bed, given hydrotherapy, a light diet, a little tincture of nux vomica before her meals and Bland's pills after her meals. She had no attacks in the hospital, and was discharged January 16, feeling very well, but with her visual fields still contracted for colors.

CASE V.—Hysteroneurasthenia; pathological character; extreme fatigability and irritability; multiple painful sensations; tremor of eyelids. Morbid fears; resistance to treatment for several weeks; then rapid improvement; gain of thirty-six pounds in weight.

Miss S., aged twenty-four years, was admitted to private ward B, October 29, 1905, complaining of severe pain in the throat and ear and of being very nervous.

The father and mother are both very nervous people, indeed the whole family is below par, nervously.

Last February the patient had a severe attack of la grippe; general pains over the body, including pain in right ear. She became much alarmed about the condition of the throat and ear. The patient was in a very fatigued and irritable condition, and her history could only with difficulty be elicited. She would fall back on the pillow and say that she was too tired to tell about her case.

Examination. Easily excitable; well-marked globus. Pressure on right side of neck makes patient wince, but no other objective changes can be made out. Heart and lungs negative. Skin of abdomen hypersensitive in ovarian regions. Marked tremor of lids.

Ear (Dr. Reik): slight subacute otitis media resulting from a chronic nasopharyngitis; external auditory canal negative.

Throat (Dr. Warfield); slight posterior nasal catarrh.

Treatment. The patient was put to bed; isolated from her family; given milk for a week, then the ward diet; a cold sponge each morning, and a cold pack at night. She was told that her trouble was mostly nervous, and that there was no reason why she should not get well. She complained so bitterly of the packs that warm baths were tried for a time, but they were even more complained of, and the packs were returned to.

Patient is most emotional and opposes the treatment. She required daily psychic treatment. The blood is normal. The patient gradually was taught to rest in bed, and to gain control of the nervous system. She was most resistant for a time, having a new pain or a new fear to complain of at every visit. She had an excellent special nurse who was gentle though firm with her. After six weeks in bed she sat up, began to walk, and toward the end of the treatment improved remarkably, gained thirty-six pounds in weight and became much quieter. Her thyroid has been a little enlarged and the eyes are slightly prominent, but no definite signs of Graves' disease could be made out. Her character was still somewhat pathological on leaving the hospital, though she considered herself well.

CASE VI.—*Neurasthenia; fatigability; incapacity for work; cure.*

J. M., insurance agent, aged forty-six years, married, was admitted February 11, 1906, complaining of "stomach trouble" and "nervousness."

His father was always a nervous man.

The patient up to the age of twenty-seven had always felt well, except for the ordinary diseases of childhood. Two years after his marriage his present trouble began. It came on insidiously. He had "an all-gone feeling" just below the breast bone. Patient has had no morbid fears except regarding his own health and taking a railroad journey. No nausea, no vomiting, no abdominal pain. The "trouble" has lasted with intermissions from its beginning to the present time. Some eructation. No excesses in alcohol or tobacco.

Examination. Patient looks nervous and rather anxious. Heart and lungs negative. Slight arteriosclerosis. Slight tenderness in epigastrium. Knee-kicks very active; no ankle clonus. Pupillary reactions normal. Mechanical excitability of muscles increased. Slight enlargement of certain of the lymph glands, including the epitrochlears and those of the neck. No objective disturbances of sensation.

Blood: red blood corpuscles, 5,344,000; white blood corpuscles, 8000; hemoglobin, 80 per cent.

Test breakfast shows a normal stomach juice. Urine negative.

Treatment. Patient was placed in bed; isolated; given milk for a week and afterward a liberal diet. He was told that he had a slight thickening of his arteries, but that the symptoms of which

he complained were nervous symptoms, and that he would recover from them. He was given cold packs at night and a cold sponge in the morning. After ten days his bed was placed in the open air for several hours a day. He recovered rapidly and left the hospital March 6, feeling well. A letter recently received from him states that he is entirely relieved of symptoms.

CASE VII.—*Fixed ideas of unworthiness and impossibility of happiness; despondency; fear of insanity; cure.*

Mrs. A., aged twenty-seven years, married, was admitted October 20, 1905, complaining of nervousness and the conviction that she could never again be happy.

Her father is an emotional man, but there has been no case similar to hers in the family.

The patient as a girl was healthy and athletic; she is well educated and has an excellent memory. She has had no children and has feared that she will not. She is despondent, and says that she is incapable; she believes that she is wicked and selfish, and is distressed because she is not sorrier about it. On inquiry a history of miscarriage in 1903 was elicited. In 1904 suffered from pelvic inflammatory disease. This was slight and yielded to treatment, and in February, 1905, after a curettement, she was sent to a seaside resort in a rather nervous condition. She improved but little.

Her main fixed idea is that she is unworthy, and that she can never be happy. Other people have treated her well; there are no persecutory ideas; no suicidal impulses. Attention easily gained; memory apparently unaffected; orientation normal for time and place; no apathy. Talked vehemently when she declared that she could never again be happy. She thought she was happy before the present attack came on, but now knows that she was never really happy. The fault is all her own. She asserts that she is not sick; she is sure she is not sick, but rather wicked. She is sure she can never change in this feeling. There have been no hallucinations; no paresthesia. At times she feels as though she could laugh and scream, but has not done so. There is no negativism and there are no stereotyped movements. She looks sad and depressed; fears she may go insane.

Physical examination negative.

Treatment. The patient was isolated and supplied with a special nurse accustomed to nervous patients. She was told that, in our opinion, she would get well and that she would become perfectly happy again. This was repeated daily. She was fed on milk for a week, after which she received a full diet. After a rest of some time in bed she was started walking, and the walking increased until it amounted to five miles per day. She began to improve in a week, but her fixed idea continued for over a month after admission to the hospital. She finally began to ask when she might go home, and was told when she became happy and well. She gradually

became better and more cheerful, and on December 2, was discharged. She has since been perfectly well and happy.

CASE VIII.—*Hysterical crises; cephalalgias; blepharospasm; rapid improvement.*

Mr. B., aged twenty-two years, was admitted February 26, 1906; discharged April 17, 1906. Complaint on admission of pains in head, weakness, involuntary winking of the eyelids, and fainting spells.

No nervous diseases in the family.

Patient has always been healthy, except for constipation during the past two years.

Last August after emotional shocks in connection with a love affair, while book-keeping, he suddenly fainted, falling off a stool; felt as though a veil were drawn across his eyes and was dizzy. Attack came on without warning. In September had a similar attack, less severe, in which he did not fall or lose consciousness, though he had marked weakness and dizziness. Since then there have been four fainting spells. He has complained also of burning sensation in the occipital region and has felt as though his skin were tight. He went into a hospital, where it was noted that he had twitching of the eyelids, usually in the afternoon. He became very nervous and according to report had "definite hallucinations," the nature of which were not described by his doctor. He had acute pain in the head, and was treated while in the hospital with chloral, bromide, and tincture of opium. He had complained of pain around the heart. When he was first admitted to the hospital mentioned the attacks occurred thrice in twenty-four hours. He took ten grains of potassium iodide three times a day while in the hospital and the attacks became less frequent, so that he had only two or three a week. His doctor states that his father had been alcoholic and died of paresis.

Examination. Patient was found to be very nervous with constant blepharospasm (tic). He was pale and covered with acne, probably due to the iodide. Tongue heavily coated and moist. Nails bitten to the quick. Heart and lungs negative. Epitrochlears just palpable, firm; extreme emotivity. Knee-kicks active. Plantar reflexes normal. Abdominal reflexes active. Blood normal.

The patient has had no attacks since entering the hospital here. On inquiry it was found that he had never bitten his tongue, and that he never saw, smelled, or heard anything before the onset of his earlier attacks. The eyes were examined by Dr. Randolph and found negative. Patient is somewhat irritable.

Treatment. Rest in bed, isolation, special nurse, cold sponge in the morning and cold pack at night; persuasion, the patient being told that his troubles were nervous and that he would recover; photoprophylactic immobility of face practised.

The patient improved steadily. Toward the end of his treatment

he was given general massage every other day. He was discharged on April 17, entirely well, having gained eighteen pounds in weight. He was then walking several miles per day.

CASE IX.—*Neurasthenia of two years' duration; hypochondriasis; thoracic pain and oppression; fear of aortic aneurysm; rapid cure.*

Mr. H., Hebrew merchant, aged thirty-seven years, was admitted January 25, 1906; discharged March 21, 1906. Complaint of pain in the chest and back. He has been told by a physician that he had an aneurysm of the aorta.

His illness began in 1904, when he noticed a pricking sensation in the left chest. He worried about his condition, and also about the death of his mother. At times he would awaken suddenly in the night with pain and shortness of breath. He would sometimes have several attacks in one day. There has been precordial oppression, and some fulness in the head. No other complaint. The physician who some time ago diagnosed aortic aneurysm, has since told him that "it is getting well." He has consulted many physicians in various parts of the country, improving for a time, but always becoming worse afterward. He has lost over twenty pounds in weight.

Physical examination is almost negative. Pupillary reactions are normal. Heart and lungs normal. Abdomen negative. No signs of aneurysm. Fluoroscopic examination reveals aorta of normal size. Urine normal.

Treatment. Patient was assured that he had no aneurysm, that his symptoms were nervous symptoms, and that there was no reason why he should not get well. He was told that it would be necessary for him to take a cure in the hospital and to put on some weight. He was put to bed, strictly isolated, given milk for a week and then a full diet. Daily encouragement. By the end of two weeks the pain in the chest had almost entirely disappeared, and a month later the patient felt perfectly well, except for slight oppression under the sternum. He walked without difficulty, which he had not done for two years or more before. He gained some ten pounds in weight before discharge. He was systematically encouraged by medical staff and nurses throughout his course of treatment.

CASE X.—*Severe cephalalgias of many years' duration; emaciation; nervousness; rapid cure; gain of thirty pounds in weight.*

Mrs. M., aged twenty-one years, married, was admitted January 24, 1906, complaining of severe headaches and nervousness.

Her family history is decidedly neuropathic, several members on both sides having had nervous prostration.

Patient has had headache since the age of nine. There have been no excesses. Menses regular. She has given birth to one child.

One and a half years ago the headaches became severe. They were sometimes unilateral. She cannot describe the pain. One headache may last as long as two weeks. She is rarely free from

headaches for longer than a week, and is compelled to go to bed when she has this pain. Has had to have morphine repeatedly for the headaches during the last year and a half. It has been given hypodermically; never more than one-eighth of a grain per day.

Patient is hypersensitive and emotional. Pupillary reaction normal. Thorax and abdomen negative on examination. Knee-kicks very active; plantar reflexes normal. Urine and blood normal. No objective disturbances of sensation. Three days after admission patient had a headache and was in a state of muttering delirium; did not respond to questions and apparently was not conscious. Pulse and respirations were normal. Pupils widely dilated. The condition lasted about two hours. It was accompanied by moderately severe headache and pain in the right eye.

Treatment. The patient was seen by Dr. H. M. Thomas and myself and was told that she needed to rest and to put on weight, and that when she had done so she would be in much better health. She was isolated from her family, over-fed, and systematically encouraged. By April 4 she had gained thirty pounds in weight, had lost her nervous symptoms, and had had only occasional headache. She had gained much in general control, and felt that she could even control the headaches to a large extent. On leaving the hospital the patient was convinced that she was quite well.

A letter from the patient dated May 9, 1906, says: "I am splendidly well, a great deal better than when I left the hospital. I seldom have a headache, and never a very bad one. I can scarcely believe I am myself, and I look so well that some of my friends here do not recognize me."

CASE XI.—Nervous gastropathy of five years' duration; recent exacerbation; fear of gastric ulcer, came to hospital for surgical operation; headaches; vasomotor disturbances; rapid cure; gain of twelve pounds in weight.

Miss E., aged twenty-four years, admitted December 15, 1905; discharge February 5, 1906. Complained of stomach trouble; had the idea that she should be operated upon for ulcer of the stomach. She had had a somewhat similar attack ten years before, when she was ill for six months. Five years ago began to have a sense of heaviness in the stomach just after meals, relieved by vomiting; no hematemesis; no localized pain in the abdomen. The symptoms continued with remissions until six weeks ago, when she began to feel very much worse, vomiting immediately after eating, or within half an hour. She has been very nervous; has suffered from hot and cold flushes, and has had severe headache above the eyes. She entered the surgical service of the Johns Hopkins Hospital, under Professor Halstead's care, and the latter deciding that operation was not indicated, transferred her to my service for medical treatment.

Physical Examination. No circumscribed tenderness in epigastrium. Stomach tympany not increased; no tenderness on either side of the spine. Heart and lungs normal. Test breakfast showed normal stomach juice. Blood examination: red blood corpuscles, 4,864,000; white blood corpuscles, 4800; hemoglobin, 75 per cent. Reflexes active. No objective disturbances of sensation. The patient is highly emotional and has vasomotor instability.

Treatment. The patient was told that there was no evidence of organic disease of the stomach, that she would not have to be operated upon, and that she ought to get perfectly well. She was kept in bed, isolated from her family, fed on small quantities of milk, gradually increased, every two hours for a week, after which she was given full ward diet without choice. She was given a cold sponge every morning and a cold pack every night. Daily psychotherapy. Her symptoms rapidly disappeared, and she left the hospital February 5, apparently in perfect health, having gained twelve pounds in weight.

CASE XII.—*Insomnia; incapacity for work; fear of insanity; obesity; rapid cure; weight reduced twelve pounds.*

Mr. P., aged fifty-six years, married, was admitted November 18, 1905, complaining of nervousness, inability to sleep, and fear of going insane.

His mother had died insane, and one of his brothers had also been insane.

In childhood the patient suffered from measles, scarlet fever, and whooping-cough. At twelve years he passed through an attack of typhoid, and at fifteen had malarial fever. He denies venereal infection. His habits have been good as regards alcohol and tobacco.

The patient states that he has always been a nervous man, and that for the past nine or ten years, dating from a period of worry over an illness in his family and certain business troubles, he has been much more nervous and sleepless; has found himself incapable of attending properly to his business affairs. For the past two or three years he has been seriously incapacitated, often being compelled to stay away from his business, that of storekeeper, for days at a time. He ascribes the incapacity to general lack of interest and energy. Lately he has been growing irritable, worrying easily over small matters, though he knows that it is nonsensical to do so. He thinks that his memory is somewhat impaired, and states that he suffers from insomnia nearly every night. He always feels worse in the morning, whereas before going to bed at night he sometimes feels in perfect health. The appetite has been variable. The bowels move regularly.

On examination the patient is found to weigh 185 pounds, though he is not a tall man. Patient does not look ill, and mentally he seems clear. The pupils react to light and accommodation. There is no glandular enlargement. The lungs are normal. On examina-

tion of the heart the point of maximum impulse is not easily visible or palpable. The deep cardiac dulness extends 8.5 cm. to the left of the middle line in the fifth intercostal space. The heart sounds are normal, and the pulse is regular in force and rhythm. The radial artery is not palpable.

The abdomen is pendulous, owing to the large amount of fat in the abdominal wall. The examination of the abdomen is otherwise negative. The knee kicks are present, but not over-active. Cremasteric and plantar reflexes normal. No objective disturbance of sensation. Station good; Romberg's sign negative. Examination of blood: red blood corpuscles, 4,830,000; white blood corpuscles, 5800; hemoglobin, 80 per cent.; no parasites.

A careful ophthalmoscopic examination was made by Dr. Bordley and the disks were found normal. The patient had some esophoria.

The patient was told that he was too fat, and that his weight should be reduced. He was also informed that a majority of his symptoms were of nervous origin, and that they were curable. He was encouraged to think that there was no reason why he should go insane. During the first few days he was kept in bed, upon a low milk diet, after which he was placed upon a reducing diet. From day to day he was encouraged as to his progress and told that we believed he would get well. After a time he was given regular room gymnastics, nearly all of the muscles being exercised in this way. Later still, he was made to walk, the distance being increased each day until he walked five miles per day. He was then advised to take a few Turkish baths before going home.

The reducing diet contained 140 grams of proteid, 30 grams of fat, and 112 grams of carbohydrates, so that he received some 1320 calories per day. He lost twelve pounds in weight in the seven weeks, regained energy and courage, and was discharged November 18, feeling perfectly well. Some months later his brother entered the hospital for treatment, and reported that the patient had been perfectly well ever since, and was doing his work with entire satisfaction to himself and his family.

It would not be surprising if he should relapse later, as the case seems to fall in the group of the "periodical depressions."

CASE XIII.—*Enteroneurosis; mucous colitis; nervous incontinence of feces; vasomotor disturbances; rapid improvement; gain of twelve pounds in weight.*

Mr. F., aged thirty years, single, a business man of sedentary occupation, consulted me for diarrhea and inability to control bowel.

The family is a nervous family, but otherwise healthy. The father's sister died of tuberculosis. There is some rheumatism in the family.

The patient had "peritonitis" for three weeks at the age of fifteen; he was not operated upon; had no return of the symptoms; it is

possible that he had an appendicitis at the time. There has been no excess in the use of alcohol or tobacco.

About one year ago he was seized with an attack of pain at dinner, followed by cramps and diarrhœa, which left him somewhat depressed. Since then his bowels have been irregular. Some six months ago a friend died, and on going to the funeral he was without notice asked to be pall-bearer. This came as a great shock to him, and since then the intestinal symptoms have been worse. He took a sea voyage, but did not improve. During the last two or three weeks he has had much pain, cramps in the abdomen, and diarrhœa. The stools are sometimes well-formed, occasionally they are watery, sometimes slimy. On one or two occasions the stool has consisted wholly of mucus. He has noticed no blood or sand, nor has he ever seen long strings of mucus. He has lost about six pounds in weight. Sleep has not been disturbed. The symptoms are not definitely related to meals. The defecation is at times imperative, and he is unable to control the bowel long enough to reach a closet. The appetite is good, though he has been restricting his diet recently, taking no vegetables except boiled potatoes. He has not used coffee for over a year.

On physical examination marked vasomotor disturbances are evident; the hands are cold and blue, and covered with clammy sweat. The eyes are lacrymose, the pupils dancing. All the reflexes are active. The patient is rather thin; dermatographia well-marked; pulse 60; the radials are palpable. No enlargement of the lymph glands, except that the epitrochlears are palpable. The thorax is rather long and the costal angle narrow. The lungs are negative. The maximal impulse of the heart is well seen and felt in the fifth intercostal space, medial from the maxillary line. Heart sounds normal. Examination of abdomen reveals a palpable sigmoid and there is a little gurgling in the right fossa. No tenderness or thickening in the region of the appendix. The liver and spleen are not enlarged. No evidence of chronic appendicitis could be made out, even by a surgical colleague who examined the patient.

On account of the history and the fact that the patient has done much yachting on the Chesapeake Bay and had drunk water from various sources, the possibility of amœbic dysentery was thought of. The stools were carefully examined for amœba, but none were found, nor were there other intestinal parasites. The mucus was so abundant and the tenesmus so intense that a thorough rectal examination seemed desirable. Accordingly a few days after admission to the private ward of the hospital the patient was etherized, and Dr. Sowers examined the whole rectum through the proctoscope. The mucous membrane was everywhere reddened and the surface exuded slightly bloody mucus and pus, about one dram of this being obtained. This blood and pus were thoroughly studied microscopically, but contained no amœbæ, no tubercle bacilli and no gonococci. Rectal

irrigations of warm salt solution were kept up for a time, but seemed to have but little effect. As the patient was studied further, the importance of the nervous side of the case became obvious, and it was decided to try antineurotic measures. Accordingly he was isolated, kept in bed, fed liberally, asked to pay as little attention as possible to his abdominal and rectal symptoms, and encouraged to think that he would get well. He was given a few rectal irrigations with solution of silver nitrate, 1 to 1500. Under these measures he gained twelve pounds in weight, the diarrhoea and pain ceased, he got control of the bowel, and seemed better in every way. He was discharged at the end of nine weeks feeling very well. He went to Atlantic City for a short after-cure, and returned to his work. He has been at work for nearly six months since and still keeps well.

CASE XIV.—*Neurasthenia; hemorrhoids; anemia; nicotinism; nervous dyspepsia and diarrhoea; fatigability; despondency; rapid cure.*

Mr. H., married, aged forty-two years, a banker, entered the private ward in November, 1905, complaining of diarrhoea and weakness. Until the onset of the present illness the patient had always been remarkably well, except for stone in the bladder, which was removed some time ago by the perineal route. The patient has had no business worries, but has been a hard worker. He has used tobacco to excess, smoking a great many cigarettes every day. Three years ago he had a serious breakdown. One morning he fainted in his office. A local doctor said that the trouble was cardiac, though another physician who saw him at the time, found no organic disease of the heart. The patient was unconscious for only a few minutes. He had no convulsion, nor did he cry out when he fell. He felt very weak after the fainting spell. About two years ago he consulted Dr. Osler in Baltimore, who found no organic disease of the heart, and advised the patient to take a long sea trip, to regulate his diet, and to rest. He improved for the time, but six months ago began to have gastric symptoms, vomiting after breakfast, no matter what he ate. His local physician made a diagnosis of chronic dyspepsia. Three months before admission he broke down completely, being unable to retain anything on his stomach, and having fifteen or twenty movements of the bowels daily. These severe symptoms lasted for over two weeks. There was pain in the abdomen with each stool. Streaks of blood were noticed in the feces, but a large proportion of the feces consisted of mucus. The patient has had hemorrhoids for five years, but aside from slight hemorrhage now and then they have not troubled him greatly until recently. The vomiting ceased before I saw him, but he had no appetite. He complains of pain in the abdomen and of passing much gas by the bowel. Constipation now alternates with diarrhoea.

Palpitation of the heart is complained of, and at times there is

precordial anxiety. There is no cough, but the patient seems short of breath on exertion.

During the last two months dull, aching pains have been noticed in the legs from the hips down. The patient feels weak generally, and though he uses very little alcohol, he sometimes walks as though he were drunk. During the last few months he has taken three drinks of whiskey a day, as it was prescribed for him by a physician. His memory of late has been poor. His speech is somewhat disturbed, and he has been very despondent. He states that he has lost twenty-two pounds in weight during the last month. Venereal disease is denied.

On physical examination the patient was found to be thin, though not emaciated. The skin was of a muddy gray tint, the superficial veins of the face dilated, the eyelids and cheeks looked a little puffy. The pupils reacted to light and accommodation. The tongue was protruded in a jerky manner and was markedly tremulous and coated. The lips were tremulous. The speech was slow and slightly hesitating, but there was no syllable stumbling. The lymph glands were not enlarged. The teeth were very defective. Tonsils somewhat enlarged; throat and nose otherwise negative. Radials palpable; pulse regular. On examination of the heart the first sound at the apex was short and resembled the second sound in character. The aortic second sound was slightly accentuated. Otherwise the heart was negative. The lungs were normal. Liver and spleen not enlarged. The sigmoid was palpable, but not firmly contracted. There was no œdema of the ankles. The knee-kicks were exaggerated, but there was no ankle clonus and the plantar reflexes were normal. The mechanical excitability of the muscles was increased. Station good. No Romberg sign.

The patient seemed very weak and sometimes talked incoherently. On trying to go to the closet in the hospital he fell on the floor. Examination of the blood: red blood corpuscles, 3,960,000; white blood corpuscles, 13,000; hemoglobin, 76 per cent.; blood pressure, 140. The urine was variable in quantity and appearance; specific gravity averaged 1020, reaction acid, faint trace of albumin, no sugar. The temperature was normal, and continued normal through his stay in hospital. The pulse rate was 120 on admission but gradually fell to 80.

From the patient's wife it was learned that he had been changing mentally somewhat during the past eight months, and especially during the last two months. The changes noted were forgetfulness, childishness, and absent-mindedness. His gait had been so unsteady that he could not walk straight. If told to go in a certain direction with his eyes closed he would land in another. On trying to light a cigarette the match would strike his face or his ear. He could not attend to his business, and even when going on trifling errands would forget them. In the morning he would talk incoherently

for a time, and sometimes failed to recognize his wife. He has had no ideas of grandeur nor made any serious business blunders. An inquiry as to drug habits revealed nothing except a few doses of trional and veronal.

At first a general paresis was suspected, but after a few days' observation it seemed clear that the patient was suffering from severe neurasthenia and the effects of excessive use of tobacco.

We decided, therefore, to isolate the patient, to put him on milk diet for a week, to cut off his tobacco entirely, and to encourage him in thinking that he would get well. He was given a little tincture of nux vomica before his meals and Bland's pills after meals. He was given cold packs at night and a cold sponge in the morning.

During the first few days he had a little veronal for his insomnia, but this was soon discontinued. At the end of six weeks he had gained nine pounds in weight. His nervous symptoms had disappeared. His mental condition had greatly improved, there was no longer disturbance of speech, and the patient felt quite strong and well. On account of his hemorrhoids he was transferred to the surgical side for operation. He bore the operation well and subsequently left the hospital in good health.

CASE XV.—*Nervous gastropathy; epigastralgia; nausea; belching; fear of gastric ulcer; rapid cure.*

Miss E., single, aged twenty-four years, was seen in consultation with Dr. Hobelman, December 15, 1905. The patient five years ago had symptoms which led her physician to suspect the presence of a gastric ulcer. She improved under careful medical treatment. Three years ago she suffered from cough, fever, and profuse expectoration, and went to the Adirondacks for a couple of months. No tubercle bacilli were found in the sputum. Last September she again caught cold and feared that her lungs were again affected, but after a visit to Atlantic City she recovered.

Last summer the patient began to have a sense of bloating and pressure after eating. In September she noticed pain soon after each meal and a sense of heaviness and pressure, as though there were a ball in her stomach. This was accompanied by nausea, but not by vomiting. Following the nausea she had gnawing pain, which increased in intensity for two or three hours and then diminished; sometimes it lasted all night unless relieved by medicine. She had been sensitive on pressure in the epigastric and left hypochondriac regions. There has never been hematemesis and no blood has been seen in the stools. The patient has been constipated all autumn. The stools have been dark all the time, as she has been taking bismuth. Two weeks ago the stomach symptoms became so severe that her doctor decided to give her stomach an entire rest and to feed her by rectal enemas. She has lost thirty pounds during the last ten weeks. She has no appetite. The

stools are very foul-smelling. Much gas is belched up and some is passed by the bowel.

On physical examination the patient is found to be fairly well nourished. Her color is good, the tongue is slightly coated. She does not seem especially nervous. Pupils normal. The glands of the neck are slightly enlarged, and on the right side of the neck there is a scar of an old operation for enlarged glands. No abnormal signs in the lungs, except possibly a slight prolongation of expiration at the right apex. The pulmonic second sound is slightly accentuated, but there are no heart murmurs and the heart is not enlarged. The pulse is regular in force and rhythm, 96. The abdomen is full, but not distended. The patient winces on pressure from the ensiform cartilage to midway between the umbilicus and the pubes. She also complains of tenderness on pressure in the left hypochondrium. There is no localized muscular rigidity, the recti being equally tense on both sides. The lower pole of the right kidney is easily palpable. The spleen is not enlarged. There is no dulness in the flanks. The liver dulness extends to within one finger's breadth of the costal margin. The sputum was repeatedly examined for tubercle bacilli, but none was found.

The patient was kept in bed and put on milk for a week. An ice-bag was applied to the abdomen. The symptoms disappeared until she was given solid food again, when she complained of some pain. This was quickly relieved by orthoform. Another test-breakfast was administered. The stomach juice contained considerable mucus, free hydrochloric acid 15, total acidity 43, no blood present. The patient thought that the passage of the stomach tube gave her great relief. We were confirmed in our idea that her stomach symptoms were of nervous origin, and therefore decided to isolate the patient completely and to keep her on a strict milk diet until she recovered. The milk was gradually increased until she took five liters per day, and after this amount was reached it was maintained for over two weeks. She had no pain or tenderness in the abdomen and remained cheerful. She was discharged apparently perfectly well on February 28, two and a half months after admission, having made a gain of nineteen and one-half pounds. The patient has been seen since and thus far she has remained quite well.

But psychotherapy as we have employed it does not always meet with success. In the *Transactions of the Association of American Physicians* for 1906 I have published the notes of a few patients who have resisted treatment and have been but little benefited. It is possible that in some of them, organic changes existed which we did not recognize. It may be that a longer trial might have ended in success; it is conceivable that successfully to treat these particular patients the more complex and difficult psychotherapeutic

measures above referred to should be employed; and it is easily possible that someone more skilled in the application of the simpler methods of psychotherapy and re-education would have succeeded.

USE AND ABUSE OF PSYCHOTHERAPY. Nearly every useful practice has some special danger associated with it. But psychotherapy need not be tabooed for the reason that some men abuse it or because quacks and charlatans degrade it. Nor dare I fail to teach students in the medical school the use of so strong a weapon because I have the fear that some among them may employ it to its discredit. Educated physicians may regret the excesses of the blindly ignorant and the unscrupulously greedy, but they should not themselves err by neglecting a side of medicine which quacks have often shown themselves more capable of exercising. If the physician relies on science, experience, and training, he will surely be protected from the vagaries in psychotherapy to which those are prone who put their trust merely in introspection, instinct, or occult revelation.¹

The psychotherapist should be an honest man and an expert clinician. He should recognize the horrible reality of the misery of the psychoneurotics. He may be more successful in understanding and treating his patients if he has had, himself, at least some little experience with the fatigues and fears of neurasthenia, provided he has made a good recovery. He must be interested in functional disturbances and not simply in anatomical lesions, and he must understand that hysteria and psychasthenia are as much diseases as are pneumonia or gonorrhœa, and often incapacitate the sufferer for a much longer period of time. *He should be skilled in all the modern refinements of diagnosis, and should exhaust them in the study of his case before beginning his therapy;* he will know how to detect the insufficient eye muscle, the hypertrophied turbinated, the inflamed sphenoidal sinus, the dystrophy of the thyroid, the incipient pulmonary lesion, the pelvic inflammatory disorder, a preataxic tabes, a larval dementia paralytica, or the onset of arteriosclerosis. He will make up his mind from his careful examination as to what organic changes exist and as to the disturbances which are "nervous" in origin. He will explain to the patient the nature of his troubles, and will tell him which of them he believes to be curable. If the patient is hysterical or neurasthenic, he will do well to avoid the use of the term "imaginary disease;" instead he will tell the patient that he is suffering from a "nervous malady," and that he sees no reason why he should not get well. He will explain to him the relation of his mental states to his symptoms, and secure his co-operation in the cure. The patients require firm guidance, but they all need judicious sympathy, a fact which

¹ J. W. Springthorpe, The Position, Use, and Abuse of Mental Therapeutics. *Lancet*, Lond., 1905, ii, 1469.

it is to be feared too few physicians and scarcely any of the laity understand.

The psychotherapist who will be successful must give a good deal of time to each patient. He must analyze the psychic state of his patient, and win his confidence by the insight he shows into his condition. The abrupt statement, "There's nothing wrong with you; go home and go to work," so often given to a neurasthenic after a negative physical examination, is but rarely efficacious. The neurasthenic is ill and knows that he is, despite the negativity of the doctor's objective examination. The physician who listens to the tale, who shows by his questions that he is familiar with many of the symptoms from which the patient is suffering, even before he speaks of them, who extends his sympathy to him in his distress, and tells him that he need have no fear, that he believes that his disease is curable and that he will help him to get well, makes the right start. If the physician knows how to follow up the advantage thus gained, he will be able to cure a very large number of these patients.

Though the limitations of the psychotherapeutic method soon become obvious to those who work with it, we should not fail to do what good we can within the limits.¹ The psychic side of cases is, it is true, only one side, but the physical side has been and probably will always remain our chief interest. With Springthorpe² I think that under existing conditions there is no likelihood of the psychic factor in disease being underestimated, or of its claims being neglected, while there can be but little doubt that the psychic factor is too often ignored and unused. This is partly due to the entire neglect of the study of psychology as a part of cerebral physiology. It is all wrong that physicians should make no attempt to reap the crop of good results which might be obtained by psychotherapy, "leaving entirely to others those exceptional harvests which astound the unenlightened and make the fame and fortune of quacks."

That in the zeal of application of new knowledge many mistakes will be made and many errors of judgment committed, we must expect; but that such incredible abuses of psychotherapy as Sollier,³ in a recent rather sarcastic article, attributes to distinguished Swiss clinicians really exist, one may well doubt. Sollier bases his allegations on the stories and letters of patients, and everyone knows how carefully such evidence should be sifted before it is accepted. His article may do good, however, if it tends to check absurdities in psychic treatment and help to protect physicians from the snares of "philosophic nebulosity" and the pitfalls of "psychologic subtlety." Psychotherapy is only one form of treatment; because we are just

¹ R. T. Edes, *Mind Cures from the Standpoint of the General Practitioner*. Med. Communication. Mass. Med. Soc., Boston, 1904, xix, 657-678. An excellent paper on the subject.

² Loc. cit.

³ Les idées actuelles sur la psychothérapie. Arch. gén. de méd., Paris, 1905, i, 463-479.

now making rapid advances in the discovery of its virtues is no reason for the neglect of pharmacotherapy, hydrotherapy, mechanotherapy, and electrotherapy in cases in which they will be of benefit.

Re-education is undoubtedly one of the most important factors in producing lasting cures. Nothing is easier among psychoneurotics, perhaps, than to make some symptoms disappear, but the experienced neurologist will not be duped into thinking that he has made a cure by driving away a symptom. In many cases it is only by influencing slowly the mind and body by careful re-education that anything like a real cure can be made.¹

The methods I have referred to in this paper are, I realize, well known to every member of this Association and are to a greater or less extent practised by all. But the methods are not as widely applied in a conscious way by the profession as a whole as they might well be, and I am wondering if those of us who are teachers direct the attention of medical students to these simple and efficacious methods as frequently as we should.

ORIGINAL ARTICLES.

THE VALUE OF A STUDY OF THE APICAL OUTLINE IN THE DIAGNOSIS OF INCIPIENT PULMONARY TUBERCULOSIS.²

BY CHARLES L. MINOR, M.D.,

ASHEVILLE, NORTH CAROLINA.

DESPITE the fact that everything that can add to our certainty in making a diagnosis of pulmonary tuberculosis should be welcomed by the profession and used by all men interested in diagnostic work, it is unfortunately true that many measures of undoubted value are neglected, not so much because the profession doubts their utility, as because of that inertia in us all which resists change and holds us to the beaten path, and to some extent because we grudge the extra time necessitated. Thus it is, for example, that the cyrtometer has found so limited a use, simple as is the apparatus and valuable as are the results. It is for the same reasons that the careful outlining of the pulmonary apices has, in this country, been so little used. Taught and practised for years by careful clinicians in Germany, dwelt on by von Ziemssen in his small but classical article "On the Diagnosis of Tuberculosis," and by

¹ L. Levy, P. E. *L'education rationnelle de la volonté; son emploi thérapeutique.* Fifth edition. Paris, 1905.

² Read at the meeting of the American Climatological Association, Atlantic City, N. J., May 14 and 15, 1906.

Kroenig¹ with even more emphasis, in his well-known article, it is yet undeniable that few American practitioners have given it any attention or used it systematically in their routine work.

This paper is written to present my impressions of the diagnostic value of outlining the apices of the lung in pulmonary tuberculosis, based on the marking of such outlines for the past six or more years in all my cases, and with the hope that it may tend to generalize its use among those medical men who pay especial attention to the early diagnosis of pulmonary disease. Since the outlining of the apices is by many called "Kroenig's sign," I would say that it seems to me a regrettable tendency in the literature of our profession to attach to diagnostic methods or symptoms the names of individuals. "The apical outline" is self-explanatory, whereas "Kroenig's sign" is not, aside from the fact that Kroenig, however excellent his work, was not the first to call attention to the subject, though he laid more stress upon it than others.

The pathological fact on which the value of this diagnostic method depends is the well-known tendency to shrinkage of the apex of the lung, and indeed of the lung as a whole, when a tuberculous process develops in it—not alone from fibroid formation with consequent contraction, but even before such fibrosis occurs, through lessened function in the apex. Le Grange² has noted that no organ modifies itself so rapidly as does the lung to accommodate itself to the greater or less activity of the demand put upon it, the inactive lung losing greatly in functioning power. Were the shrinkage of the apex caused by fibrosis alone, the diagnostic value of its determination would not be so great, as only when the process has advanced far enough for fibrosis to manifest itself could it be of use; but since the lung decreases in size and functional activity when disused or when disease is developing in it, such shrinkage appears very early and its determination thus becomes a valuable early sign.

Taking up first the technique, I would note that in mapping out the apical lines, great accuracy is desirable, and it is best to use the little finger as a plessimeter. I have not used a plessimeter other than the finger. The percussion stroke here, more than in any other percussion, needs to be very carefully and correctly made, the most vertical elastic stroke possible, generally very lightly made, alone giving accurate results. The patient should sit erect or stand directly facing or backing the examiner, according as we are to mark out the anterior or the posterior outlines; in both cases care must be taken that the head is held exactly in an anteroposterior plane, since if turned to one side or the other the tension of the muscles of the neck is altered and the note affected. In my expe-

¹ Zur topog. der Lungenspitzen, etc., Berl. klin. Woch., 1889, No. 37; 1900, No. 20.

² Medication par l'exercice, Paris.

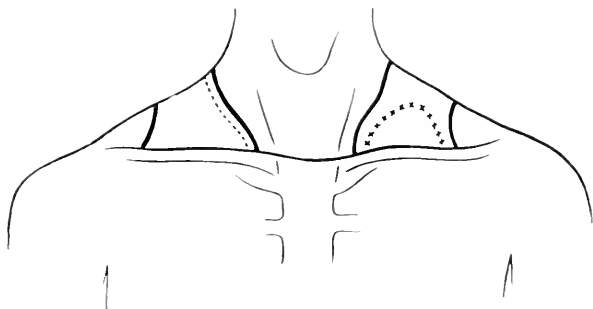
rience the front outlines can be best obtained from the front, except when the supraclavicular fossæ are very deep—which may prevent the proper placing of the plessimeter finger; but cases of doubt should be verified by percussion from behind. Percussion for the inner anterior line should start well up the side of the neck, above the lung, and come slowly downward until pulmonary resonance is found, when the inner border of the plessimeter finger should be indicated by a dot of the blue pencil. Repeating this from behind forward we get a series of dots, which we unite with a line. The outer border should be approached from the shoulder and marked off in the same way. In percussing out the posterior lines it is advisable not to have the upper ends of the anterior lines visible, as if they are it will inevitably affect our judgment, while the fact that the upper end of the posterior line coincides accurately at the trapezius bilaterally with the anterior line, when run independently, adds to our assurance of the correctness of our results. The outlines according to Kroenig, as quoted by Fraenkel,¹ are as follows: "The highest level of the apex behind is at the level of the first dorsal spine. Its distance from the midline is 5 to 6 cm. (2 to 2.4 inches) from the highest point. The posterior inner border converges in a line convex to the spinal column to the level of the lower border of the second dorsal vertebra and thence runs downward parallel to and 1 cm. from the spine of the vertebræ." The posterior external border is not given by Fraenkel. The anterior external border runs from a little outside the middle of the anterior border of the trapezius rather steeply downward and outward to intersect the clavicle and the junction of its outer and middle one-third. The anterior internal border starts 4 cm. internal to the anterior border on the free edge of the trapezius, and runs from here to the sternoclavicular joint.

My personal experience largely, but not entirely, agrees with these findings. Owing to the very various inclinations of the outline from shoulder to neck, at times very steep, at times much less so, I find the distance at the top between the outer and inner lines varies even in healthy lungs and cannot be safely stated at 5 to 6 cm. Again, I have found the highest level of the apex to lie as often between the first dorsal and the seventh cervical as at the level of the first dorsal. The posterior external line, in my experience, runs from the middle of the length of the spine of the scapula upward and inward with its concavity outward, to a point from one and one-half inches to two and one-half inches from the highest point of the inner line. The anterior inner lines are generally concave inward above and slightly convex inward below, the lower end not being at, but a half-inch external to, the sternoclavicular joint, although the exact determining of this point is not

¹ Path. u. Therap. d. Lungenkrankh., p. 725.

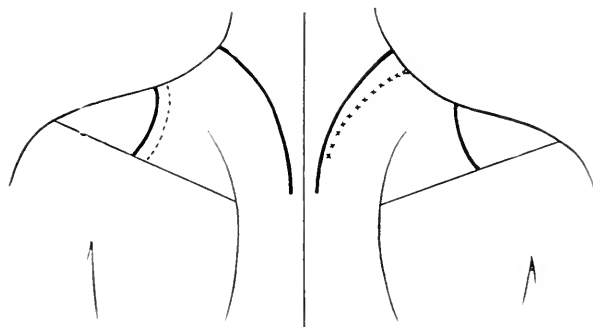
easy, owing to the nearness of the trachea and the large joint. The anterior outer line is steeper than the inner and concave outward, the lower end, as Kroenig notes, ending very regularly at the junction of the outer and middle thirds of the clavicle. I reproduce herewith two diagrams (Figs. 1 and 2), taken accurately from the human body, showing the normal course of these lines. I have marked on them with dotted lines the common variations from the norma in disease.

FIG. 1



— normal outline of the apex; . . . outward dislocation of the inner border; x x x marked shrinkage of both borders (front view).

FIG. 2



— normal outlines of the apex; . . . inward dislocation of the outer border; x x x outward dislocation of the inner border (rear view).

In early tuberculosis, especially of the apex, but also of lower portions of the lung, careful percussion will very generally demonstrate a dislocation of the inner line outward. I have found that the inner line, both anteriorly and posteriorly, is likely to be the earliest affected, which when we remember that incipient lesions are prone to develop toward the inner border of the lung, seems natural. The posterior inner line changes chiefly or only in its upper two-thirds. The dislocation inward of the outer border generally occurs later, and a change of both inner and outer lines is naturally less common than of the inner or outer alone. In early cases the

lines do not approximate at the top, but join their fellows from the rear; in old cases with marked fibroid shrinkage they often run together to an apex before they reach the trapezius border. I have found the diagnostic value of these outlines in earlier cases, and to some extent their prognostic value later, to be considerable, not, of course, when taken alone, for no sign unsupported by others has great value; but in combination with others, such a dislocation occurring in a dubious case, with other signs in themselves not final, may serve to clinch a diagnosis. A slight inward alteration of a border anteriorly and posteriorly carefully verified, will raise to a far higher value ambiguous auscultatory signs. Outward dislocation is, as I have said, neither so early nor quite so easy to determine, but if certainly demonstrated has equal value. Dislocation without marked flattening or hollowing of the supraclavicular fossa would seem to depend on lessening of volume from lessened function, while that accompanied by such hollowing or flattening would point to the existence of fibrosis, though only post-mortem evidence could verify this assumption of mine.

One will often find in a case wherein one apex shows a burnt-out fibroid process and the other an incipient trouble, that the former will give marked dislocation and a hollowed supraclavicular fossa, while the latter will often show little or no hollowing at all, but a slight unilateral or bilateral dislocation. Bilateral dislocation speaks almost certainly for a fairly advanced or an old burnt-out process, and since the signs of an arrested process are often equivocal the determination of such an alteration is of value. Von Ziemssen's assertion that apical shrinkage can be entirely compensated for or obliterated by compensatory emphysema, which according to Fraenkel was denied by Oesterreich, I have found to be true repeatedly, nothing being commoner in an incipient case recovering than to see such dislocations gradually disappear, and at the same time to note a filling out of a flattened fossa and a return to more normal resonance, due to compensatory emphysema. Such shrinkages can also give valuable early warning of involvement of a hitherto unaffected apex. I would say that when, as is so often the case, we find changes in the breath sounds without dulness at a right apex and are in doubt whether to consider them physiological or pathological, we should be especially careful to map out the outline; such breath sounds in a right apex showing shrinkage have a greatly increased diagnostic value.

In drawing a prognosis, also, one can at times derive aid from a study of the apical outline, chiefly from such re-expansions, as I have just dwelt on. When early in a case, before fibrosis can be expected, we find rapid and marked shrinkage, it speaks for a notable effect on the function of the lung and probably a severe process. Again, it can aid us in giving proof of active fibrosis, when, as I have said, the dislocation is accompanied by marked slowly advancing hollowing of the supraclavicular fossa.

THE RONTGEN RAYS IN THE EARLY DIAGNOSIS OF PULMONARY TUBERCULOSIS.¹

BY WILHELM LEHMANN, M.D.,

INSTRUCTOR IN DERMATOLOGY AND DIRECTOR OF THE DEPARTMENT OF RADIOGRAPHY AND
ACTINOTHERAPY IN THE COOPER MEDICAL COLLEGE, SAN FRANCISCO, CALIFORNIA.

AND

WILLIAM C. VOORSANGER, M.D.,

VISITING PHYSICIAN TO THE MT. ZION HOSPITAL, AND CHIEF OF THE MEDICAL CLINIC OF
THE EMMANUEL SISTERHOOD POLYCLINIC, SAN FRANCISCO, CALIFORNIA.

(From the Röntgen Department of the Cooper Medical College and the Medical Clinic of
the Emmanuel Sisterhood Polyclinic, San Francisco, California.)

THE early diagnosis of pulmonary tuberculosis is so important and so far reaching in its ultimate result and benefit to the patient, that every aid at our command should be employed to assure certainty in its incipency. Scientists, for the past fifty years, have realized this fact, and men like Buhl, Villemin, Virchow, Laennec, Broussais, and others have striven, working to be sure from different theoretical points of view, to establish a tangible, etiological, and pathological basis for pulmonary tuberculosis, in order that this once attained, early diagnosis might be made and thereafter perhaps successful treatment instigated. In spite of all the theories and facts that the ages have handed down to us, in spite of Koch's tubercle bacillus, we have not yet reached the point where we can make a diagnosis of *incipient* tuberculosis, for often when we discover tubercle bacilli in the sputum, or get marked auscultatory or percussion signs, the process is far advanced. We must, to-day, recognize von Behring's latent form of tuberculosis in children, and a certain form of peribronchial or bronchial gland tuberculosis, so strongly advocated by A. Fränkel, in his recent exhaustive treatise on "Diseases of the Respiratory Tract." Both of these forms are frequently beyond clinical detection. Recognizing that the typical clinical signs are often only present when the disease is fairly well advanced, the clinician becomes dependent for an early diagnosis upon slight shades of difference in the breath sounds, only ascertainable by the trained auscultator. It, therefore, behooves us to follow Professor Grancher's advice and use every aid at our disposal.

The chief aid for which we make a plea now is the use of the x -rays. This has not yet come into general use in the hands of the practitioner, in spite of the work of Holzknacht, Williams, Beclère, Bouchard, Kelsch, Maragliano, and others, all of whose statements lead us to one conclusion, namely, that the x -rays are an important adjuvant in pulmonary tuberculosis, and should be part of the physician's clinical equipment, as much as auscultation, percussion,

¹ Read before the San Francisco County Medical Society, March 13, 1906.

sputum examination, or serum diagnosis. The last Tuberculosis Congress at Paris unanimously adopted the use of the x -rays as a valuable aid in the diagnosis of pulmonary tuberculosis, advocating its general employment.

The facts which up to date have been established on this subject are: (1) Williams' diaphragmatic sign—the lessening expansion of the diaphragm on the side where there is a beginning tuberculous process; (2) the finding of more or less centrally located affections, especially small or more pronounced shadows along the bronchi, which have been explained as, and by autopsy proved to be, peribronchitic tuberculosis; centrally located cavities, which may escape clinical detection, are also brought to light by the Röntgen rays; (3) haziness of the apex or of the whole lung which anatomically corresponds to thickening of lung tissue; and (4) proof of the existence of peribronchial enlarged glands.

These four points are the most important in beginning tuberculosis, often escaping clinical detection, and, if discovered by the x -rays, speak almost conclusively for a beginning process in the lungs. In considering these points, the fact must be born in mind that the Röntgen rays show anatomical lesions, the meaning and etiological character of which can only be interpreted by comparison with the clinical picture. Thus, this careful comparison will enable us to explain shadows found by the x -rays, as recent infiltration in one case, as old scar in another. Besides, other diseases which may cause similar x -ray signs must be carefully excluded beforehand, and errors like the following, avoided:

1. Motion of the diaphragm may be interfered with by abdominal disease, affection of the diaphragm itself, or decreased action of the lung following secondarily pathological conditions of the mediastinum, such as aneurysm, tumors, etc.

2. The central shadows alluded to will be found within the so-called "lungs or hilus drawing," a representation of the branches of the larger bronchi with their accompanying vessels. This condition differs very widely in different individuals, being more pronounced in old people, due to ossification of the cartilages, and in certain classes of workmen, due to anthracotic changes, etc.

3. Haziness of the lung. Any kind of stasis will produce lessened transparency, as in circulatory disease. Transparency of the lungs also varies with the development of the panniculus adiposus, variable light of the tube, etc. Consequently, when making examinations, we should only compare different parts of the same thorax and not different plates.

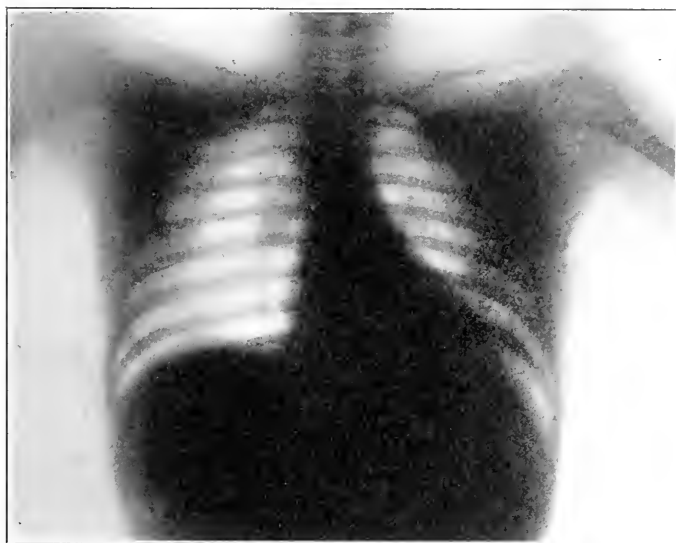
4. Enlarged bronchial glands may occur in other diseases, such as malignant tumors, pseudoleukemia, etc.

But if we take cognizance of all these sources of error which often deceive us, and avoid them, the x -rays will prove of inestimable value and assist us to come to definite conclusions.

It is always as important to make a plate as well as a screen examination, because the plate, properly made with a low vacuum tube, reveals fine details which screen examinations may not bring out, while on the other hand the screen shows us the motion of the diaphragm, difference in expiration and inspiration, and especially inspiratory clearing up of certain points in comparison with others. In order to be as exact as possible in our observation, and not be influenced by the x -rays over the clinical findings, or vice versa (for it is a fact that the clinician often deceives himself by trying to make the x -rays bear out his clinical findings), we employed the following method:

Dr. Voorsanger first took an accurate clinical history, and made a physical examination and (when possible) an examination of

FIG. 1



Radiogram of the chest of S. A. (Case I).

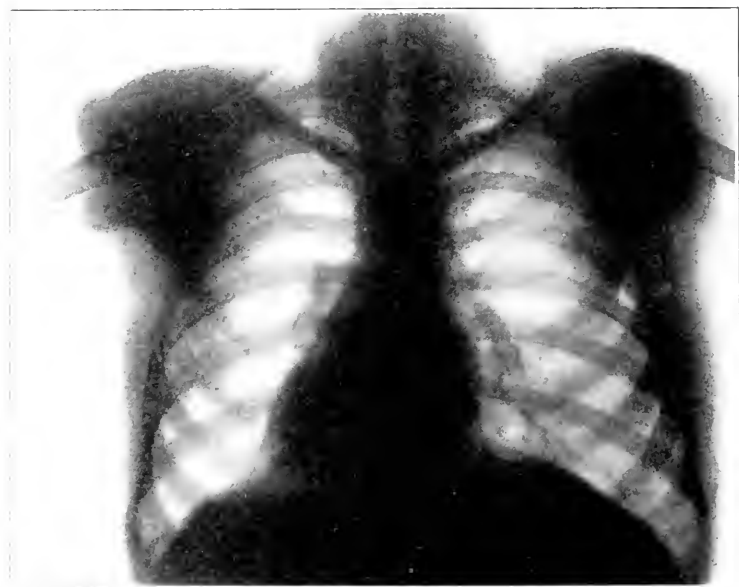
the sputum; the patient then was sent to Dr. Lehmann, who made screen and plate examinations, and wrote full reports of both; and finally the clinical and x -ray notes with the plates were carefully compared.

We present the following brief notes of a series of cases selected from a varied material:

CASE I.—S. A., a single female, aged twenty-one years, a coat-maker, applied for treatment, March 1, 1905, complaining that for four months (following an attack of pneumonia) she had had cough, profuse expectoration, night sweats, loss of weight, and nervousness. Two months ago she developed dyspnea and pain in the chest, and had two attacks of hemoptysis. Her appetite

was poor, and her bowels constipated. Previously, she had been well. Her father died at the age of twenty-eight years, and her mother, at twenty-three, from pulmonary tuberculosis. Two paternal aunts also died from tuberculosis. The patient weighed one hundred and twenty-seven pounds. In the erect posture the chest moved freely and equally. In the right supraclavicular region there was a high-pitched percussion note, but there was no dullness elsewhere throughout the lungs. In the upper part of the right scapular region and in the right supraclavicular region the expiration was somewhat prolonged. Otherwise there was normal vesicular breathing throughout both lungs. There were no rales. The sputum contained no tubercle bacilli. *Diagnosis:* Incipient

FIG. 2



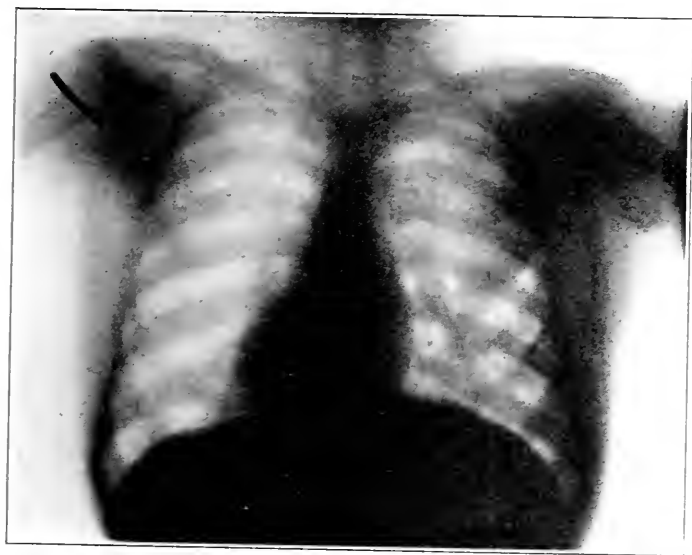
Radiogram of the chest of R. H. (Case II).

tuberculosis of the right apex. *Röntgen examination* revealed good and equal transparency of both lungs, except in the left lower lobe, some small shadows in the region of the right hilum, and less movement of the left diaphragm (Fig. 1). *Conclusion:* The x-rays showed infiltration in parts that were negative clinically, and did not demonstrate the affection of the right apex suspected clinically; the central findings of the right lung suggest a peribronchial tuberculosis.

CASE II.—R. H., an unmarried man, American, aged twenty-nine years, applied for treatment March 23, 1905, complaining of cough, considerable yellowish expectoration, and loss of weight (nine pounds), of four weeks' duration. There had been no night

sweats, and no hemoptysis, and the appetite was good. The mother and grandmother had died of tuberculosis. The patient was rather anemic and somewhat emaciated. The deep cervical glands were somewhat enlarged. There was marked depression above both clavicles. The chest moved freely and equally on both sides. The percussion note in the right supraclavicular and infraclavicular regions as far as the second rib was dull-tympanic; below this, as well as anteriorly and laterally on the left side, the note was tympanic. In the right supraclavicular region there was prolonged bronchial expiration; at the left apex posteriorly prolonged expiration. Below the middle of the right scapula subcrepitant rales obscured expiration. No tubercle bacilli were found in the sputum on two examinations. *Diagnosis:* Tuber-

FIG. 3

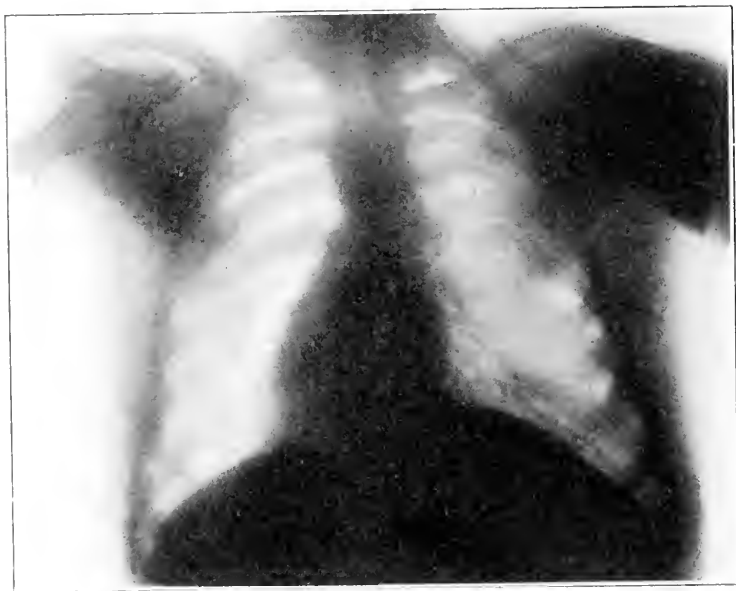


Radiogram of the chest of D. K. (Case III).

culosis of the right upper lobe. *Röntgen examination* revealed about equal transparency of both lungs, but less at the apices, especially at the left; some diffuse band-like shadows on both sides within the "lung-drawings"; the diaphragm movements good and equal on both sides. The plate (Fig. 2) shows centrally located, peribronchial infiltration, but little marked haziness about the left apex. *Conclusion:* According to the screen examination, and in view of the fact that recent infiltration usually does not show up in the plate as well as old indurations, the *x*-rays examination confirmed the clinical diagnosis of apical lesions and showed peribronchial tuberculosis—from which the apex lesions usually start.

CASE III.—D. K., aged twenty-nine years, a Roumanian, laundryman, applied for treatment August 8, 1905, complaining of slight cough and pain in the chest of eight months' duration. Eight days ago he expectorated blood, and since then has had night sweats. Previously he had been well. His family history is negative. There was a high-pitched percussion note in the right supraclavicular region, but otherwise no dullness. The respiration anteriorly and posteriorly over the right apex was roughened. The sputum contained a few tubercle bacilli. *Diagnosis:* Tuberculosis of the right apex. *Röntgen examination* revealed good transparency of both lungs, better in the lower parts than in the middle,

FIG. 4

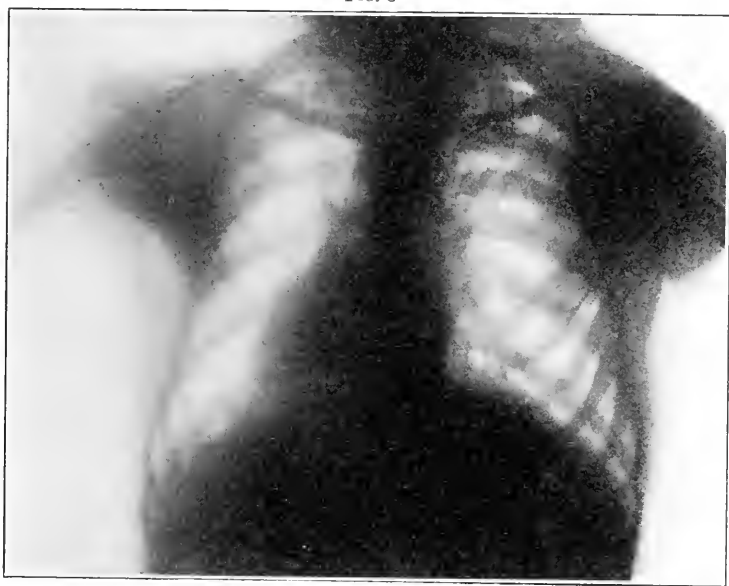


Radiogram of the chest of A. (Case IV).

and still less in the apices, especially the right; some small diffuse shadows within the "lung drawing" on both sides, expansion of the diaphragm 2 cm. less on the right than on the left side. The plate (Fig. 3) shows markedly less transparency of the right upper and lower lobes, extensive lesions at both apices, and marked central peribronchitis on both sides, extending especially to the lower lobes. *Conclusion:* Perfect confirmation of the clinical diagnosis by the x-rays, which showed in addition more diffuse lesions than were brought out by the physical examination. The patient was sent to the Denver Hospital for Consumptives, where he made a complete recovery, gaining thirty pounds, and losing all signs of tuberculosis.

CASE IV.—A., aged forty-four years, a Russian tailor, applied for treatment April 10, 1905, complaining of tightness over the front of the chest, weakness, and occasional dizziness, of three years' duration. Previously he had been well. His family history was negative. After the patient had spent six months in the Denver Sanatorium, he weighed one hundred and forty-eight pounds, and was slightly anemic. The chest moved freely and equally, and there was no dulness on percussion. In the left infraclavicular region the inspiration was diminished and the expiration prolonged. Anteriorly on the right side there was vesicular breathing; posteriorly in the right scapular region, prolonged bronchial expiration, in the

FIG. 5

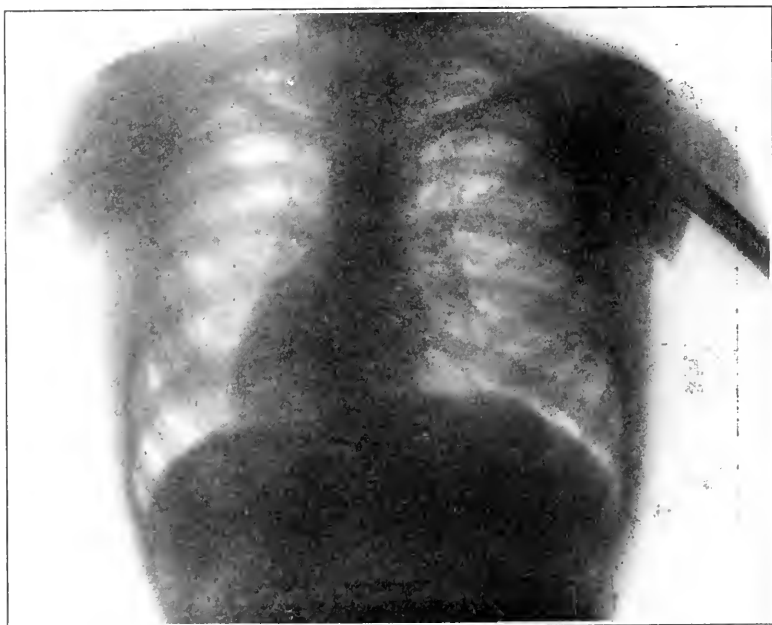


Radiogram of the chest of M. Z. (Case V).

left supraclavicular region diminished breathing with occasional crepitant rales, and lower down bronchovesicular breathing. The sputum contained no tubercle bacilli. *Diagnosis:* Tuberculosis of both apices. *Röntgen examination* revealed moderate and equal transparency of both lungs, equally less at both apices; some small diffuse shadows within the "lung drawings" on both sides; good expansion of the diaphragm. The plate (Fig. 4) shows haziness over the whole right upper lobe and pronounced peribronchitis on both sides. *Conclusion:* The involvement of the left apex did not show up as well with the *x*-rays as clinically, but the *x*-rays showed more extensive lesions at the right apex and centrally than was suspected clinically.

CASE V.—M. Z., a Russian painter, aged twenty-six years, applied for treatment June 23, 1905, complaining of cough and copious expectoration of eight months' duration, hemoptysis four weeks ago, and night sweats for eight days. There had been no loss of weight, the appetite was good, and the bowels constipated. The patient weighed one hundred and twenty-eight pounds, and appeared well nourished, aside from some sinking-in about the cheeks. There was marked anemia and enlargement of the cervical glands. The chest was well developed. Anteriorly, the lower border of the right lung was freely movable. The left supraclavicular and infraclavicular regions were tympanitic on percussion;

FIG. 6



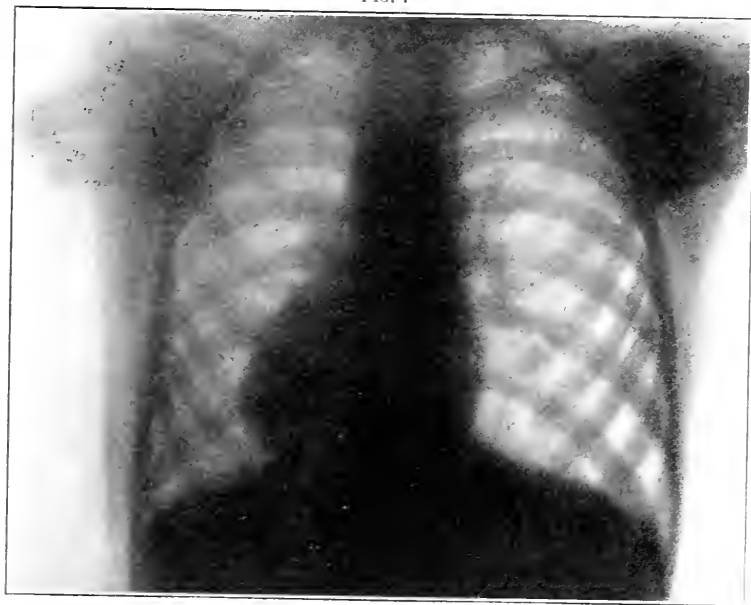
Radiogram of the chest of G. M. (Case VI).

otherwise the percussion note was normal. The respiratory sounds over both apices posteriorly were roughened, and on the left side were accompanied by crepitant and moist rales. The sputum contained tubercle bacilli. *Diagnosis:* Tuberculosis of the left apex and probably of the right apex. *Röntgen examination* revealed good and equal transparency of both lungs, but less at both apices, especially the right; moderate excursion of the diaphragm on the left side, markedly less on the right side. The plate (Fig. 5) shows extensive involvement of the left apex, less at the right apex, and marked central peribronchitis. *Conclusion:* The x-rays confirmed the clinical findings, but showed the extent of the lesions better

than did the physical signs, and make positive the clinical suspicion of involvement of the right apex.

CASE VI.—G. M., a married woman, aged twenty-five years, and a native of California, applied for treatment October 16, 1905, complaining of cough and greenish expectoration of several months' duration, pain in the lower chest and back (aggravated by coughing), substernal soreness, and loss of weight. There had been no night sweats, the appetite was good, and the bowels regular. Previously she had been well. The family history was negative. The patient's chest moved freely and equally; there was no dulness on percussion. Above both clavicles there was diminished vesicular respiration,

FIG. 7



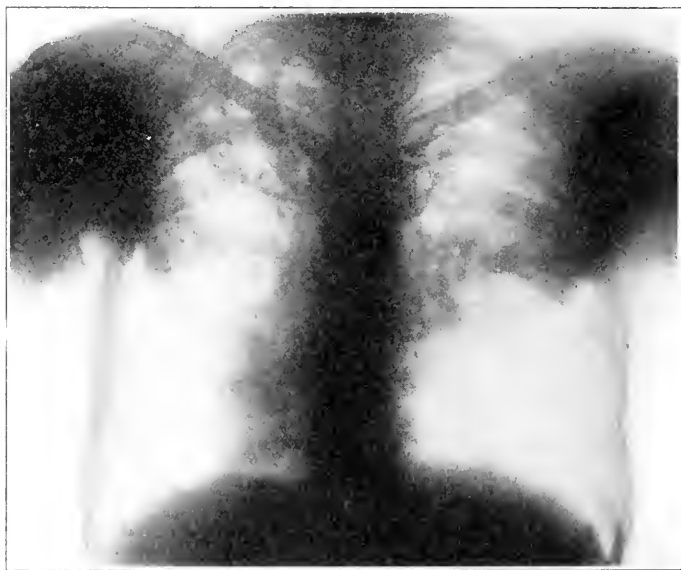
Radiogram of the chest of F. P. (Case VII).

with harsh inspiration. In the right suprascapular region the inspiration was somewhat roughened. The sputum contained no tubercle bacilli. *Diagnosis:* Probable tuberculosis of the right apex. *Röntgen examination* revealed good transparency of both lungs, but less at the apices than elsewhere; the right apex did not clear up on deep inspiration; the movement of the diaphragm was not good, being distinctly less on the right side. The plate (Fig. 6) shows some density at both apices, but nothing definite except a marked and extensive peribronchitis which can be followed along the branches of the bronchi, where they form dense, circumscribed infiltrations, especially on the right side. *Conclusion:* The x-rays confirmed the clinical suspicion of tuberculous involvement of the

right apex; and they revealed especially well the central lesions that were not evident clinically.

CASE VII.—F. P., a girl, aged eleven years, a native of Austria, applied for treatment February, 1906, complaining of cough, morning expectoration, night sweats, and frontal headaches. Previously she had been well. Her father had advanced tuberculosis, and one sister incipient tuberculosis. The patient was emaciated, markedly anemic, and had enlargement of the cervical glands and a flat chest. At the left apex the percussion note was high-pitched, the breath sounds were harsh, and an occasional rale could be heard. The sputum contained no tubercle bacilli. *Diagnosis:* Incipient tuberculosis of the left apex. *Röntgen examination*

FIG. 8



Radiogram of the chest of W. C. (Case VIII).

revealed good and equal expansion of both lungs, moderate and equal expansion of the diaphragm, and marked "lung drawings." The plate (Fig. 7) shows some small diffuse shadows the size of hazel-nuts; one sharply defined near the aorta. *Conclusion:* The x-rays did not disclose the apical involvement clearly; but did reveal enlargement of the peribronchial glands and infiltration about the small bronchi—confirming the diagnosis of incipient tuberculosis.

CASE VIII.—W. C., a sailor, aged thirty years, applied for treatment February 16, 1906, complaining of cough, fever (?), expectoration, night sweats, and pains throughout the body of one month's duration. He had lost twenty pounds. Previously

he had been well. The family history was negative. The patient was quite anemic. The chest moved equally, but not freely. There was dulness on percussion at the left apex as far as the second rib, and posteriorly in the left suprascapular region. The breath sounds at the right apex anteriorly were almost bronchial in character and there was an occasional rale; at the left apex there were crepitant rales as far as the middle of the scapula. Sputum was not obtainable. *Diagnosis:* Tuberculosis of the left upper lobe. *Röntgen examination* revealed moderate transparency in the lower part of both lungs, much less in the middle portion and apices, not only haziness of both upper lobes, but also a number of small, partly circumscribed, partly diffused shadows, especially in the region of the right "lung drawing"; in the middle and lower lobes of the right side a dense area extending laterally; movement of the diaphragm on the left side, even on forced inspiration, only 4 cm., on the right side, 2.5 cm. The plate (Fig. 8) shows infiltration of the upper lobes and of the right middle lobe (which is especially dense), and a large number of circumscribed shadows extending from the "lung drawings" over the entire involved area. *Conclusion:* The *x*-rays proved the case to be one of advanced tuberculosis, although the symptoms are only of a few weeks' duration; this makes the prognosis much worse.

When this paper was read we reported eighteen cases in detail, but we have been obliged to omit the notes of ten on account of lack of available space. One of these was of much interest: That of Q. W., a girl, aged 13 years, who had lupus of the nose of two years' duration, tuberculosis of the larynx, and enlarged cervical glands; but no symptoms and no physical signs of pulmonary tuberculosis. Röntgen examination, however, revealed lessened transparency of the lungs, moderate but equal expansion of the diaphragm on both sides, and a few sharply circumscribed shadows near the "lung drawings." These, in all likelihood, were tuberculous bronchial glands, from which we may expect later spreading of the disease to the lungs.

In conclusion, we should say that the clinical and the *x*-ray findings have agreed in the main; but in the majority of the cases the *x*-rays afforded valuable information as to the extent of the lesions—which were often more widespread than the ordinary clinical evidences seemed to suggest. When the diagnosis was in doubt, on account of absence or insufficiency of clinical signs, the *x*-rays showed a peribronchial or bronchial gland affection—the value of which in prognosis, as well as in diagnosis, is of enormous importance. In a few cases, involvement of an apex evident clinically was not recognizable by the *x*-rays, because recent infiltration, though sometimes sufficient to cause clinical signs may not be sufficiently dense to produce a shadow or haziness on the *x*-ray plate or screen.

HEMATOLOGICAL STUDIES IN TUBERCULOSIS.¹

BY ARNOLD C. KLEBS, M.D.,

CONSULTING PHYSICIAN TO THE COOK COUNTY HOSPITAL FOR CONSUMPTIVES, DUNNING,
ILLINOIS,

AND

HENRY KLEBS, M.D.,

OF CHICAGO.

Not very long ago the opinion prevailed that in tuberculosis, particularly its pulmonary form, examination of the blood could not reveal any marked changes, such as one would expect from the apparent anemia and the more or less marked lesions in the lungs. This refers more particularly to the condition and number of the erythrocytes and to the hemoglobin, the leukocytes receiving only scant attention and the reports of alterations in their number being confusing and contradictory. A very good historical review of this subject has recently been given by Ullom and Craig,² so that it is not necessary for us to enter into it again. In this article the authors give also the results of their own investigations, embracing thirty-nine cases, together with a *resume* of the modern work done on this subject up to the middle of 1905.

Since this time two new investigations have been reported—by Arneith³ and Kjer-Peterson.⁴ On account of the great numbers of observations made, the methods used, and the perfection and refinement of technique not heretofore employed, these two studies command close attention. They both attempt to bring order into the confusion which has characterized thus far our conceptions in regard to the leukocytic elements in the blood of tuberculous individuals. Everything in this direction is eminently welcome, at a time when we are becoming more and more convinced of the fundamental role of the leukocytes in natural and acquired immunity. During the last winter, with the assistance of Dr. Milton W. Hall, we began a series of systematic investigations,⁵ based upon the methods given in these investigations, particularly that of Arneith's.

If we give here a preliminary report of the results without being able to draw definite and exact conclusions, we do so because we

¹ Read at the meeting of the National Association for the Study and Prevention of Tuberculosis, Washington, D. C., May 17 and 18, 1906.

² Examination of the Blood in Pulmonary Tuberculosis, with Special Reference to Prognosis, AMERICAN JOURNAL OF THE MEDICAL SCIENCES, September, 1905.

³ Die Lungenschwindsucht auf Grundlage klinisches und experimenteller haematologischer Untersuchungen, Johann Ambrosius Barth, Leipzig, 1905.

⁴ Ueber die numerischen Verhältnisse der Leukoeyten bei der Lungentuberculose, Würzburg, 1906.

⁵ The investigations were made at the Cook County Hospital for Tuberculosis at Dunning, Illinois, and at the Chicago Laboratory. At the former, Dr. E. S. Moore, resident physician at the hospital, gave much valuable assistance in the work.

feel that in a complex subject like this, involving many laborious examinations, any contribution may prove helpful in future investigations. A more detailed report on this subject will be made in the near future.

Before reporting on our own results we shall give a brief review of the investigations mentioned. Kjer-Peterson, in the first part of his work, dealing with the normal numerical relations of leukocytes in the blood, after a careful analysis of the literature on the subject, comes to the conclusion, that our present-day conception of the subject is based on the results of uncritical and unscientific examinations. His technique for the leukocyte count does not differ essentially from that employed before. He uses the ordinary Thoma-Zeiss chamber without divisions, counting the whole visual field as a unit, according to 'Thoma's method' (quotients to be calculated for each microscope, as has been done for some time in this country), but an enlargement of seventy only, instead of Thoma's two hundred, and always with ocular divisions. For diluting fluid he uses 0.3 per cent. acetic acid solution with methyl violet, and he counts in dilutions of 1 to 20. By this method he is able to count much more rapidly than with any other, and by an exact determination of sources of error, to which he has given particular and painstaking attention, he believes that he can always obtain accurate and uniform results. The average error in his examinations does not exceed 8 per cent., which corresponds to a great degree of accuracy. He does not consider any work exact in which the percentage of error is not determined.

If the above method, for details of which we have to refer to the original, is carried out with the precaution referred to, repeated counts become unnecessary, except for the determination of the "homogeneity" of the blood. Drops of blood taken successively from blood coming from the same puncture do not always contain the same number of leukocytes per unit volume. Kjer-Peterson calls such blood "inhomogeneous," and the counting of leukocytes in such cases does not give figures which can be used as the expression for the actual number of leukocytes. "Homogeneity," therefore, must be determined before the counting can become of practical value.

With this additional precaution, Kjer-Peterson has made numerous counts in healthy individuals. He comes to results which among themselves are quite uniform, but much at variance with those obtained by other observers. This part of his work is of particular interest, since we cannot but be conscious of the uncertainty of our knowledge in this respect, each observer apparently having his own normal standard and using the term "leukocytosis" in conformity therewith.

The number of leukocytes in the blood of healthy adults per c.mm. as usually given ranges between the widely separated limits

of 5000 and 10,000, with some variation as to the upper and lower limits. (Grawitz, Engel, Halla, Rieder, v. Jaksch, etc.) The French observers, however, seem to have adopted a narrower and lower "normal" zone (Hayem, Malassez, Grancher, Bouchut and Dubrisay, etc.). Arneht seems to be the only German observer who restricts the normal range to 5000 and 6000, and in this restriction goes even farther than the French school. Kjer-Peterson is at variance with all other observers, in that he maintains that it is impossible to give a definite level for the normal leukocytic curve of men and women, since they differ essentially. He finds for healthy men a nearly uniform and constant level of the curve between 4000 and 5000, with individual differences rarely going above 5000 and never below 3500. In healthy women, on the other hand, he finds all figures between 3000 and 24,000. He obtained these figures from examinations made early in the morning, upon the patient's awakening, and before the first meal. He insists on this time as the best for obtaining uniform and comparable results, although he doubts that digestion has any influence at all on the leukocytic curve, while motion and exertion seem to affect the curve decidedly, though only temporarily. Another difference noted between the leukocytic curve of men and women is that the curve of the former shows a straight and constant level, while the course in the latter is given to great variations, the blood, therefore, showing "inhomogeneity." He comes to his conclusion from his examinations of five men and thirteen women, a small material, as he himself admits, especially in the case of the men, but he believes this objection to have been overcome by continuing the study of each individual for long periods.

In regard to the subject which particularly interests us, that of pulmonary tuberculosis, his results are based on a carefully analyzed material of 142 men and 171 women, mostly patients of the Vejlebjerg Sanatorium. This certainly must command attention, particularly when we consider the painstaking attention which was given to every detail of technique and the series of single examinations. The author classifies his cases according to the intensity and extent of the pathological process in each, and since we have based our own classification upon his, we shall outline his method here.

Like the one adopted by the National Association for the Study and Prevention of Tuberculosis this classification is based on the one of Turban. The Roman numerals indicate various degrees of the anatomical extension of the process. To these Kjer-Paterson adds further symbols, indicating thereby other characteristics, particularly in regard to the intensity of the process. This has been attempted similarly by Turban and Meissen, but Kjer-Peterson's symbols seem to me to give more clearly a condensed description of a case in regard to its intensity and extent.

Each stage¹ is divided into active (*A*) and passive (*P*) cases. He calls active cases those with general constitutional symptoms, which indicate progress of the disease, fever (normal is 98° to 99.7° F. maximum rectal), night sweats, emaciation, or local symptoms, as hemoptysis, and also cases in which the history and examination reveal that the local process is more or less in a state of development. Passive cases are those in which the above symptoms are not found.

The defects of any such classification in its practical application are, of course, also inherent in this one, especially as the determination of activity or passivity gives great latitude to individual difference of opinion. Kjer-Peterson satisfied the claim for great objectivity, however, by having each case independently classified by a clinical authority and by giving very exact case histories.

With this general subdivision of his material he gives the results of his examinations and tries to establish the possible causal relations between the numerical relations in his cases and the various incidents in the course of the disease. He takes exception to the work of Appelbaum, which is always regarded as authoritative, and calls it "a collection of theories and postulates, without there being presented a single figure to substantiate the theses." On the other hand, the results of his examinations of the whole coincide more with those of Stein and Erlmann,² who came to the following conclusions:

1. Increase of leukocytes in tuberculous individuals, if there is not present a chronic, prevalent or exudative, inflammatory process, speaks for cavity formation in the lung.³

2. The beginning of cavity formation in a case can be determined by consecutive counts of the leukocytes, and by a sudden increase in their number after a prolonged normal period.

3. Cavity formation can be excluded in most cases, if normal numerical conditions are found. The increase of the leukocytes is not due to the tuberculous virus as such, but is a consequence of septicemia, caused by certain highly virulent bacteria, not by

¹ The upper two right lobes or two half lobes are always counted as one.

I. Stage. I A (Active).

I P (Passive).

II. Stage. II A (Active).

II P (Passive).

III. Stage. III A Disease stationary or retrogressive.

III A_{1a} Afebrile case.

III B_{1b} Occasional temperatures of 100° to 101.3° F. (rectal).

III A_{1c} One or more periods of temperature above 101° F.

III A₂ Advancing though intermittent cases

III A₃ Continuously advancing cases.

III P₁ Passive cases with predominating sclerotic processes (stethoscopic finding).

III P₂ Passive cases with predominating destructive processes (stethoscopic finding).

² Zur Frage der Leukocytose bei tuberculösen Processen. Deutsches Archiv. f. klin. Med., lvi.

³ A view held in this country for years by Cabot.

what is usually understood by the term mixed infection, which cannot, with certainty be excluded in any form of tuberculosis.

Kjer-Peterson finds no distinct relationship between the local extent of the changes in the lung and the leukocyte count, both in men and women. The level of the curve seems to be lower the more passive the process. In active cases in women, however, he sometimes has found low values. He finds no constant relation between variations in temperature and the number of leukocytes, and in rapidly progressing cases of the third stage he finds leukocytic curves of either very high or very low level. With a single exception he found that high leukocyte counts were met in cases with very bad prognosis or in which there were other complications (tumor, fetid bronchitis, etc.). Contrary to the usual opinion, therapeutic measures, which would induce decrease, rather than increase, of leukocytes in the capillary blood, would recommend themselves in such cases.

In this work no attempt is made by its author to differentiate the varieties of white cells. In regard to the results of recent investigations in this field we find again a great and confusing divergence in the reports presented. Responsible for this chaotic condition are principally lack of uniformity in classification of the leukocytes and also of the cases, in regard to the stage of the disease. Anything that will promote uniformity in these matters will materially help us to a better understanding of the morbid processes under consideration.

In our counts we have not been able to adopt all the precautions recommended by Kjer-Peterson, his monograph having appeared so recently. Therefore the figures which we obtained and which are given in the tables cannot be compared directly with those obtained by him. They are, however, comparable among themselves and with the results obtained by differential methods of cellular analyses. A more extensive reference to Kjer-Peterson's methods and findings is made here, because in our future studies of the numerical leukocyte relations they shall be based on his technique, and also because it is hoped that other investigations may be made which will allow comparison. All our counts were made four to five hours after the first meal, but no attempt was made to determine the "homogeneity" of the blood. The results of our counts which are tabulated, together with other findings, will be discussed later.

That a differential examination and count of the white cells is necessary in order to determine whether an increase of leukocytes can properly be considered as a "leukocytosis," has occasionally been insisted on. Da Costa,¹ for instance, understands by the term "leukocytosis" an increase of the polynuclear neutrophilic white

¹ Clinical Hematology, London, 1902.

cells. Strauss and Rohnstein¹ observed in chronic pulmonary tuberculosis the following average percentages: multinuclear, 80.8 per cent.; mononuclear, 17.2 per cent.; lymphocytes, 13.1 per cent. They are impressed by the fact that with progressing disease there is a tendency to decrease of the mononuclear percentages. R. Cabot finds little qualitative changes in many cases; sometimes he has noted with a normal leukocyte count an increase of the lymphocytes and large mononuclears. With an increase of the total leukocytes he observed the ordinary marked increase of the polymorphonuclears at the expense of the lymphocytes. He has seen the eosinophiles increased in some cases with cavities, but he does not consider this fact of any particular importance, as have others. Another American observer, Swan, notes in the second and third stages, polynuclear leukocytosis, increase of the eosinophiles, a fact which he considers prognostically favorable.

Holmes² has studied the morphology of the white cells in the blood of tuberculous patients. He believes that tissue destruction goes parallel with disintegration of the white cells and that the degree of regenerative power can be estimated by the intensity of the nuclear stain, the number of intact nuclei, the relatively high percentage of young cells, and the increase of eosinophiles.

Arneth,³ in an exhaustive monograph, has described his method, technique, and results of finer morphological and particularly nuclear studies of neutrophiles in infectious diseases, including tuberculosis. In the work above referred to he gives a *resume* of all his investigations in tuberculosis. The neutrophiles on account of their predominant numbers (75 to 100 per cent.) among the total of all leukocytes must play, according to him, a most important role in the organism. He divides the neutrophiles into five classes: His Class I contains mononuclear neutrophiles, Class II, neutrophiles with two nuclei or particles of nuclei, Class III three, and so on. He makes, furthermore, subdivisions according to the shape and number of the nuclear subdivisions. A neutrophile of Class I, with an absolutely round nucleus, he designates as myelocyte (M). The other forms in this class with more or less indented nuclei, which he thinks correspond to the polymorphonuclears of other authors, he calls in accordance with the degree of indentation: W. (wenig) for slight, T. (tief) for deep indentations.⁴ In other classes he notes whether there are nuclei in the shape of loops (S-Schlinge) or round nuclear particles (K-runder Kernteil).⁵

¹ Die Blutzusammensetzung bei den verschiedenen Anämien, Hirschwald, Berlin, 1901.

² The Diagnosis of Tuberculosis from the Morphology of the Blood, Medical Record, 1896, and other articles.

³ Die neutrophilen weissen Blut-Körperchen bei Infectious Krankheiten, Gustav Fischer, Jena, 1904.

⁴ In our tables we have adopted the symbols Sl and D, according to the English nomenclature.

⁵ In our tables marked as L. and R.

He examines the dried-blood film, stained with Ehrlich's triacid solution, and always determines in each case the total number of leukocytes. By always counting one hundred cells his figures indicate the percentage of the various groups. The various combinations of loops and round nuclei in the neutrophils and the three groups in Class I give a total of twenty subdivisions of his original five classes. This seems at first very complex, but after some experience one learns to classify rapidly the cells according to their respective subdivisions, provided one has a well-stained specimen.

By arranging the numbers found into tables horizontally one next to the other, beginning with Class I at the left end, he receives what he calls a neutrophilic "blood picture." From an average of fifteen single examinations of healthy adults he determines his standard normal neutrophilic blood picture, which we shall give later. He finds this picture altered in pathological conditions, though not parallel with the changes in the total number of leukocytes. He can find a profound alteration of the blood picture with a perfectly normal (5000 to 6000) leukocyte count. His tables give a very clear demonstration of these conditions. Thus he finds it necessary to distinguish different kinds of "cytoses" (abbreviation for leukocytoses); "hyper-," "normo-" and "hypocytoses" indicating increased, normal, and decreased number of leukocytes; and as regards the blood picture, he then distinguishes isocytoses and anisocytoses, *i. e.*, those with normal and those with altered blood picture. Since the numerical findings of the leukocytes do not correspond with the alterations of the blood picture, in order to designate these relations he speaks of anisohypercytoses, isonormocytoses, anisonormocytoses, and anisohypocytoses. The terms here enumerated designate the relations most frequently encountered.

The cells with the more complex nucleus (higher classes) Arneith thinks are the riper and more efficient ones, while the others are the youthful and therefore less efficient types (contrary to Holmes). The pathological alterations of the blood picture are characterized by the disappearance or decrease of the cells from one class and the appearance or increase of cells in another; one can then speak of a shifting of the blood picture to the left or the right. By a great number of examinations of the blood picture in infectious diseases and also in experimental infections and intoxications of rabbits, Arneith has been able to demonstrate a constant and direct relation between the course of the disease and the relations of the picture. The latter are, therefore, an index of the defensive and protective efforts of the body against infections.

Before recording the results of examinations made by ourselves, we shall reproduce some typical blood pictures of his and also some of our own, taken at random from our records. In the tables

below we have, for the sake of simplicity, avoided giving the results of the counts in the lesser subdivisions. Though they have all been made in each case, the sum for each principal class is here given. In a more detailed later report we shall give all the divisions.

Picture 1. Arneth's normal (average of fifteen examinations) neutrophilic blood picture. (Isornormocytosis.)

	I	II	III	IV	V
Actual leukocyte count, 5500	5%	35%	41%	17%	2%

Picture 1 illustrates a normal distribution of various neutrophilic cell types. We see that the types of Classes III and II predominate, with a fair percentage of cells of Class IV. In the picture (2) of a case of acute miliary tuberculosis (patient died nine days later), which is one of successive examinations, we can observe the typical "shifting" of the picture to the left; practically all the cells are crowded into the first two classes. Only the more youthful elements are left to carry on the struggle, and this condition increases with the progress of the case. The total leukocyte count is low.

Picture 2. Miliary tuberculosis, Arneth's Case I, September 1, 1904. (Anisohypocytosis.)

	I	II	III	IV	V
Actual leukocyte count, 4400	36%	56%	8%		

We find similar conditions in the third picture, which, however, is not taken, as in the last case, from an early series of examinations, but from the last of the series, shortly before the death of the patient. It shows the last phase of continued alteration of the blood picture, with slight hyperleukocytosis.

Picture 3. Subacute (not miliary) tuberculosis, Arneth's Case 5, October 2, 1903. (Anisohypercytosis.)

	I	II	III	IV	V
Actual leukocyte count, 8400	45%	52%	3%		

Picture 4. Chronic pulmonary tuberculosis, stage I A, Case 5(34). (Anisohypercytosis.)

	I	II	III	IV	V
Actual leukocyte count, 7600	14%	37.5%	36%	11%	2%

Picture 4 is derived from one of our few cases which do not show extensive alterations. It is also one of those cases which are very difficult to classify as regards activity or passivity. There is very slight fever, only occasionally, rarely reaching above 100°. A further alteration in the blood picture, observed later, should make the prognosis more unfavorable than a general clinical consideration of the case would allow.

Picture 5. Chronic pulmonary tuberculosis, stage I P, Case 8(37). (Anisonormocytosis.)

	I	II	III	IV	V
Actual leukocyte count, 5800	2.5%	51%	38.5%	8%	

Picture 5 shows a slightly more marked alteration, especially in Class II. Diagnosis is made from the results of physical examination, not verified by the microscope. The patient lost in weight very considerably. By no means a clear case; the low percentage in Class I is remarkable and may perhaps have diagnostic significance, together with the number of leukocytes.

Picture 6. Chronic pulmonary tuberculosis, stage II A, Case 24(52). (Anisohypercytosis.)

	I	II	III	IV	V
Actual leukocyte count, 7600	14%	56.5%	24.5%	4.5%	0.5%

Picture 6 is from a patient with extensive pulmonary lesions and signs pointing to considerable activity of the process. The number of leukocytes is only slightly increased, while the blood picture is markedly shifted to the left. Prognostically, from every view point this is a bad case, though not nearly as extensive in regard to the pulmonary lesions as the two following cases:

Picture 7. Chronic pulmonary tuberculosis, stage III A (3), Case 30(59). (Anisohypercytosis.)

	I	II	III	IV	V
Actual leukocyte count, 8400	55%	38.5%	5.5%	0.5%	0.5%

Picture 8. Chronic pulmonary tuberculosis, stage III P (1), Case 26(54). (Anisohypercytosis.)

	I	II	III	IV	V
Actual leukocyte count, 27,080	29.5%	60%	9%	1.5%	

Pictures 7 and 8 were obtained from far advanced cases with extensive pulmonary lesions. The principal difference in the two blood pictures seems to be in the first two classes and in the leukocyte count. The last case is interesting, for the fact that in spite of very advanced lesions there has been a gain in weight although the blood picture deteriorated.

As regards the "normal neutrophilic blood picture" series of examinations have shown us¹ similar relations to those obtained by Arneth in healthy individuals. The examinations were made at different times of the day in specimens of blood from six individuals, and objectivity of judgment was ensured by independent counts and subsequent comparison of results. A distinct uniformity of results was quite striking, the ratios of distribution of the five principal types of cells being quite constant. We can, therefore, thus far confirm this part of Arneth's results, contrary to Flesch and Schlossberger,² who on examination of twenty-six normal individuals, mostly children, found a very different numerical distribution of the cells in the five classes. They, however, recognize also a fairly uniform "normal" picture.

Further serial examinations of neutrophilic pictures of healthy

¹ Reported at the meeting of the Chicago Pathological Society, April, 1906, by Drs. Hall and H. Klebs.

² Die Veränderungen des neutrophilen Blutbildes, Jahrbuch f. Kinderheilkunde, 1905.

individuals of both sexes, at various age periods, and under different external influences, seem most desirable and we have planned such investigation on a larger scale. The technique of the method is quite simple; particular attention is necessary to ensure thin blood smears. Undue pressure in the spreading of the blood on the cover-glass can lead directly or indirectly to a distortion of the cells and so artificially modify the picture. That the spreading, drying, fixing, and staining of the blood has a direct influence on the shape of the nuclei is forcibly suggested by the photographs recently obtained, by means of the ultra-violet light (Ernst, Grawitz), of polymorphonuclear leukocytes not previously prepared. In these the nuclei do not seem to have the complex conformation seen in the stained specimens. Further improvement in the technique of ultra-violet photography, however, is necessary before pictures obtained by it can be compared with the stained specimens. The stain used by Arneth is the triacid solution of Ehrlich, not a good nuclear stain, a fact which he thinks is rather of advantage, because it avoids too great detail in the nucleus. In our examinations various stains have been tried, and we found that for proper differentiation of nuclear forms the triacid solution gave very unsatisfactory results. For this reason, Wright's stain has been employed in most instances, with better result. At least one hundred cells have been counted at each examination and in different specimens. The accurate and minute classification of the cells constitutes the principal difficulty of the method. The proper distribution of the cells, however, into the principal classes is not so difficult, and for practical clinical purposes this probably suffices.

The uniformity which the normal blood pictures maintain with varying total leukocyte figures impressed us particularly.

The blood pictures shown above as examples on the whole confirm Arneth's observations. All of them except 4 and 5 show marked alterations. A material so uniformly bad as ours does not permit far reaching conclusions as regards prognosis. An interpretation of the finer changes in our blood pictures is quite difficult and ought to be made with caution, and it will need many further examinations and technical improvements to make the method more serviceable. In the following table we have arranged the cases according to the alteration of the neutrophilic picture, which they presented, beginning with those in which the alteration was slightest. This arrangement is not absolutely correct, because it is based upon the sum of cells found in the first two classes only. A variation between these two classes, as frequently observed and perhaps of considerable importance, therefore, is not taken into account in this arrangement. It seemed to us, however, of advantage to range the cases by some approximative method for purposes of a general survey.

Serial No.	Case No.	I +	Leuko- cyte counts.	Stage.	Sex and age.	Remarks.
1	28 (56)	41	17,000	II A	M. 42	
2	5 (34)	51	7,300	I A	F. 21	Operated for appendicitis, retroversion, pleurisy, lymphocytes above normal.
3	7 (36)	52	4,350	III A ₃	M. 77	Emphysema, tabes dorsalis, died day after.
4	8 (37)	54	5,800	I P	F. 27	Asthma, bronchitis, no tubercles, increase of eosinophiles 7 per cent.
5	29 (58)	55	9,800	III P ₁	M. 51	Thrombus of right brachial.
6	27 (55)	59	7,900	III A ₁	M. 35	Unconscious, died in night.
7	22 (50)	64	9,200	III A ₁	M. 40	Unconscious, dying.
8	10 (38)	66	5,560	I P	M. 29	Scoliosis, gain in weight, well nourished, drinker.
	(a)		12,200			
9	25 (53)	67	12,600	III A ₁ b	M. 27	Large cavity, abundant sputum.
			12,200			
10	24 (52)	71	7,600	II A	F. 29	Epileptic.
11	20 (48)	73	14,200	III A ₁ b	M. 26	Marked pleurisy.
12	16 (44)	74	15,970	III A ₁	M. 36	Cavity, abundant sputum.
13	18 (46)	75	7,100	III A ₁ b	M. 55	Cavity.
14	31 (60)	75	7,600	III P ₁	M. 48	Very chronic type, twenty years, able to work.
15	4 (23)	75	9,000	III A ₃	M. 30	Acute nephritis, syphilis, small loss in weight, drinker.
16	13 (41)	76	10,400	III A ₁ b	M. 27	Abundant sputum, losing in weight.
17	15 (43)	76	9,200	III A ₂	M. 42	Mitral regurgitation, large cavity, abundant sputum, drinker.
			8,640			
18	11 (39)	79	5,230	III A ₂	M. 48	Suspected cavity, hemoptysis, lymphocytosis.
			13,800			
			9,400			
19	19 (47)	80	7,560	...	M. 26	
20	23 (51)	81	16,400	II P	M. 35	
21	32 (61)	82	5,000	III A ₃	M. 21	Large cavity, hemoptysis, lymphocytes normal.
22	12 (40)	83	17,000	III A ₃	M. 40	Cavity, profuse hemoptysis, syphilis, lymphocytosis (losing).
23	3 (32)	83	17,321	III A ₁	M. 32	Large cavity, large quantity sputum, numerous tubercles, drunkard, rapidly losing in weight.
			12,400			
			19,000			
			18,400			
24	1 (30)	83	9,700	III A ₂	M. 42	Cavity, pneumothorax, hemoptysis, abundant sputum.
			10,200			
			10,110			
			11,160			
			8,800			
			9,000			
25	6 (35)	87	10,555	III A ₂	F. 18	Cavity, moderate quantity sputum, lymphocytosis.
			13,500			
			17,200			
26	9 (38)	87	11,000	III A ₂	M. 33	Rapid decline.
27	17 (45)	88	6,910	III A ₃	F. 47	Generally firm, cedema, died in evening.
			7,600			
28	14 (42)	90	3,300	III A ₁	M. 38	Dying.
			6,770			
29	26 (54)	90	22,800	III P ₁	M. 21	Scoliosis, tuberculous coxalgia, cavity, gain in weight.
			27,080			
30	21 (49)	91	13,500	III A ₂	M. 26	Lymphocytes markedly subnormal.
31	30 (59)	91	8,400	III A ₃	M. 50	Large cavity, great emaciation, delirious.
32	2 (31)	95	8,950	II A	M. 16	Tuberculous peritonitis, fecal fistula, splenic tumor.
			11,120			
			12,200			

If we compare the figures in the two columns of the neutrophilic pictures and the total leukocyte count we find with increasingly damaged blood pictures every degree of normocytoses or hypercytoses. On the whole, however, there appear with increasing alterations of the blood pictures also the higher numbers of leukocytes. The exceptions are quite evident, but an interpretation of the discrepancies is very difficult. Several of our figures were obtained from single observations only, and since variations occur, we probably should have had to modify them after frequent repetitions of the examinations. In studying the table this defect must be considered.

Examples of cases with a damaged blood picture but with normal or nearly normal leukocyte numbers are found in cases (serial Nos.) 13, 14, 15, 17, 18, 19, 21, 27, 28, 31. They are all prognostically very unfavorable cases. Arneth thinks that the particularly unfavorable aspect of these cases is due to the disproportion existing between the production of young and the destruction of older cells. The young cells are just sufficient in number to counterbalance the loss of older cells without being able to fill the deficit. If hypercytotic figures are reached the deficit can be supplied and the prognosis becomes better. That this does not always bring about an improvement of the picture and the condition of the patient the greater number of our cases demonstrates.¹

The more or less profound alteration of the neutrophilic picture which we have observed in all the severe cases of tuberculosis, with very few exceptions, seems in general to confirm Arneth's statements. Prognostically, we could not draw valuable conclusions from the condition of blood pictures, which in itself is of no particular significance, considering the preponderant majority of far advanced cases. Examination of patients in the first and second stages, and also of patients treated with tuberculin which we have begun, will throw further light on the question. The method would certainly have the advantage of simplicity over others, particularly that of determination of the opsonic index, and for that reason alone, further investigations along these lines seem desirable. This preliminary report is intended to induce such.

FURTHER NOTES ON THE SERUM DIAGNOSIS OF TUBERCULOSIS.²

BY HUGH M. KINGHORN, M.D.,

AND

DAVID C. TWICHELL, M.D.,

OF SARANAC LAKE, NEW YORK.

(From the Saranac Laboratory, Dr. E. L. Trudeau, Director.)

At the meeting of the National Association for the Study and Prevention of Tuberculosis held in Washington in May, 1905, one of us reported the results obtained with the serum diagnosis of tuberculosis. The method used was that of Arloing and Courmont, and their A homogeneous culture was employed.

¹ An interesting feature in our material is the fact that there are several cases with both tuberculous and syphilitic lesions. In how far this fact can affect the blood picture cannot be surmised from the small number observed.

² Read at the meeting of the National Association for the Study and Prevention of Tuberculosis, Washington, D. C., May 17 and 18, 1906.

Of the 62 patients tested, 43 had pulmonary tuberculosis, 7 were more or less suspicious as having tuberculous disease, and 12 were apparently in sound health. Of the 43 tuberculous patients, 79 per cent. reacted positively; of the 7 suspicious patients, all reacted positively; of the 12 healthy persons, 9 reacted and 3 failed to react.

The provisional conclusions drawn from these results were: (1) That in far advanced cases with very extensive or virulent lesions the serum reaction is generally absent; (2) that the reaction seems to appear most often with the most favorable cases; (3) that a certain number of favorable cases with well-marked signs of disease fail to show any agglutination; (4) that in the tuberculous cases the average agglutinating power is 1 to 10; (5) that 9 out of 12 healthy persons agglutinated positively; and (6) that from these results no reliance was placed on the serum test as being a sure and reliable one for the presence or absence of clinical tuberculosis.

The number of healthy persons tested was too small from which to draw definite conclusions. Further tests, therefore, were made not only with serums obtained from healthy persons, but also with serums obtained from tuberculous patients, and from those with other diseases. Dr. David C. Twichell became associated in this work, and the total number of cases tested by us was 247.

All the tests were made according to the directions of Paul Courmont. His A homogeneous culture was used throughout. It was grown in a bouillon consisting of peptone (Witte), 20; sodium chloride, 10; glycerin, 40; water, 1000. This was neutralized with normal soda solution. This formula was given by Dr. Courmont, but differs from his in that Witte's peptone (German) was used instead of Dufresne's (French peptone).

For several months we were unable to make any tests, as the cultures could not be agglutinated. We wish to thank Dr. Mazzyk P. Ravenel for helping us out of this difficulty. At his suggestion we planted from agar into broth, and we then found that the cultures could be agglutinated in the proper way. The value of this method was still further increased by making use of the suggestion given by Dr. E. R. Baldwin. He advised planting from a potato culture containing 6 per cent. glycerin into broth. As a result we have had no further trouble. Our routine plan now is to plant from a potato culture with 6 per cent. glycerin into four bottles, each one containing 25 c.c. of broth, and not to plant from broth to broth. We have no difficulty in always having at least two out of four cultures at standard strength. This method removed the chief difficulty which has always been experienced by those who have used the serum diagnosis for tuberculosis.

To standardize the cultures we took four bottles planted on the same date, and of about the age of one month, and tested them with the standard serum. In making the dilutions we took 1 c.c. of culture and diluted it with 40 c.c. of 0.85 per cent. sodium chloride. This

gave a slightly milky emulsion. The standard serum was obtained from cow No. 5, belonging to the laboratory, and when diluted with two parts of normal salt solution it agglutinated at 1 to 33 the homogeneous emulsion thus prepared. If the standard serum agglutinated the culture above or below 1 to 33 it was not at standard strength, and was not used for the test. Every test was controlled by using the standard serum. We wish also to say that the tests made on healthy serums were uniformly distributed throughout our work, and were intermingled with the tests on tuberculous serums. At the suggestion of Dr. Trudeau the results of the tests were always recorded on paper before reference was made to the names of those persons whose serums were tested. In this way we were entirely unbiased in our judgments, and did not know which were the healthy and which were the tuberculous serums.

Clear, fresh human serum was used, and was obtained either from the lobe of the ear or from a vein in the arm. With each serum, mixtures of different strengths were prepared—at 1 to 5, 1 to 10, 1 to 15, and so on; thus, 0.2 of serum 0.8 of emulsion of broth culture (1 to 5); 0.1 of serum 0.9 of emulsion of broth culture (1 to 10); 0.06 of serum 0.94 of emulsion of broth culture (1 to 15); 0.04 of serum 0.96 of emulsion of broth culture (1 to 25), etc.

When agglutination took place in a dilution of 1 to 5 the reaction was considered positive. The time limit given to the test was five hours, not more. The tests were made at room temperature. Agglutination was observed by the naked eye up to five hours. Results were considered positive only in those tubes which showed well-marked flocculi easily visible to the naked eye, and with subsequent sedimentation and clearing.

RESULTS. The total number of patients tested was 247. Of these, 70 were persons in apparently good health; 155 were patients with pulmonary tuberculosis; 22 were patients with doubtful tuberculosis or with other diseases. Of the 247 patients, 212 reacted positively (85.82 per cent.); 35 failed to react (14.18 per cent.). Of the 70 healthy persons, 59 reacted positively (84.28 per cent.); 11 failed to react (15.72 per cent.). Of the 155 patients with pulmonary tuberculosis, 135 reacted positively (87.09 per cent.); 20 failed to react (12.91 per cent.). Of the 22 patients with suspicious signs of tuberculosis and with other diseases, 18 reacted positively; 4 failed.

The 70 healthy persons whose serums were tested were in apparently sound health. Their occupations, of course, differed widely. Most of them belonged to the better classes of society. There were also Adirondack Mountain guides, painters, physicians, nurses, and commercial travellers. Some of these persons had been exposed to patients who were suffering with pulmonary tuberculosis. We did not make a physical examination of the lungs, nor did we test these persons with tuberculin. They were all, however, in appa-

rently sound health. From the figures given above, it is seen that of 70 healthy serums 84.25 per cent. agglutinated positively, and that 15.72 per cent. failed to agglutinate. The larger the number of healthy serums tested the higher the percentage of positive reactions rose, and it seems to us that this percentage would be higher if we had tested a larger number of healthy persons. The average strength of agglutination in these cases was 1 to 13.67. The agglutinations varied from 1 to 5 to 1 to 100. The serum which agglutinated at 1 to 100 was from a very healthy young woman of fine physique and of athletic habit. She was the widow of a patient who had had pulmonary tuberculosis.

Of the 155 patients with pulmonary tuberculosis, 135 reacted positively (87.09 per cent.); 20 failed to react (12.91 per cent.).

These patients differed very widely as regards the extent and gravity of their disease. A few were latent or healed cases, and were either known to have had the disease at a previous time, or had physical signs of latent tuberculosis. The patients who reacted positively to the tuberculin test had either physical or rational signs which pointed to tuberculous disease, but it was necessary to use the tuberculin test to confirm the diagnosis. These are classed with the tuberculous patients. The advanced and far advanced are classified together, as it is very hard to classify rigidly some of the patients. Of the 5 latent or healed cases, 4 reacted positively; 1 failed to react. Of the 17 patients which reacted to the tuberculin test, 17 reacted positively (100 per cent.).

The agglutination of these cases was always tested before the tuberculin was given. Of the 38 incipient cases of tuberculosis, 36 reacted positively (94.73 per cent.); 2 failed to react (5.27 per cent.). Of the 95 advanced and far advanced cases, 78 reacted positively (82.10 per cent.); 17 failed to react (17.90 per cent.).

It is seen that all the patients that reacted to the tuberculin test also reacted to the serum test. In a certain number of these, the agglutination was tested before the tuberculin was given, and from eight to twelve days after the tuberculin reaction, in order to see if any increase in the agglutination occurred from the tuberculin reaction. Some of the serums showed an increased agglutination after the tuberculin reaction, other serums remained the same. The patients tested in this way were too few to allow us to come to any definite conclusions. The average agglutination of these tuberculin patients was 1 to 19, and the variations were from 1 to 5 to 1 to 75. Of the 38 incipient cases of pulmonary tuberculosis 94.73 per cent. agglutinated positively and 5.27 per cent. failed to agglutinate. The cases that failed to react to the serum test had physical signs of pulmonary tuberculosis, and tubercle bacilli in their sputum. In one of these cases it was necessary to inoculate a guinea-pig with the sputum before tubercle bacilli could be demonstrated. The pig developed tuberculosis, and tubercle bacilli were found in the spleen.

At a later date the serum of this patient showed well-marked agglutination at 1 to 5. The average agglutination in the incipient cases was 1 to 11.15 and the variations were 1 to 5 and 1 to 33.

Of the 95 advanced and far advanced cases 82.10 per cent. reacted and 17.90 per cent. failed to agglutinate. The average agglutination in these cases was 1 to 12.17, and the variations were between 1 to 5 and 1 to 75.

Of the 22 remaining patients, 8 had suspicious signs of tuberculosis, but no definite diagnosis was made, and they were not tested with the tuberculin test. Six of these 8 patients reacted and 2 failed. Of 6 persons who were subject to attacks of bronchial asthma, 6 reacted. Of 2 patients who gave a history of pleurisy both reacted. A patient with tuberculous glands of the neck did not react. A child with tuberculous meningitis did not react; the spinal fluid was tested. One patient with cellulitis of the finger reacted, as did also a patient with suppurative otitis media, and a pregnant woman.

In comparing our work with that of Dr. Paul Courmont we wish to state again that we followed his directions in every detail, and that we used the A homogeneous culture of Arloing and Courmont in every test. The only variations that occurred were that we used Witte's peptone instead of Dufresne's peptone, and that we transplanted from a potato culture into broth instead of from broth to broth. The tuberculous cases tested by Courmont were mostly taken from the services of Professor Bondet and Professor Tesseire at the Hotel Dieu at Lyons, France. Our tuberculous cases were all taken from patients who were undergoing climatic treatment for tuberculosis in the Adirondack Mountains. This explains why the average of our agglutinations is higher than that of Courmont, namely 1 to 14.82 for us and 1 to 10 for Courmont. Our patients were thus under the very best hygienic and climatic conditions, while Courmont's were mostly confined to a hospital.

In clinical cases of tuberculosis, Courmont obtained 87.9 per cent. of positive reactions; 12.1 per cent. of negative reactions; while we obtained, 87.09 per cent. of positive reactions; 12.91 per cent. of negative reactions.

In persons apparently in good health, Courmont obtained 26.8 per cent. of positive reactions; 73.2 per cent. of negative reactions; while we obtained, 84.28 per cent. positive reactions; 15.72 per cent. negative reactions.

As mentioned above, the larger number of healthy serums tested, the higher the percentage of reactions rose. In our judgment there is little if any difference between the agglutinating power of healthy and of tuberculous serums—namely, 84.28 per cent. for healthy and 87.09 per cent. for tuberculous serums. The average agglutination is also practically the same—namely, 14.82 for tuberculous patients and 13.67 for healthy persons.

CONCLUSIONS. From our investigations we must conclude that the serum diagnosis of tuberculosis as used by Arloing and Courmont is not a specific sign of the presence of clinical tuberculosis, since healthy and tuberculous serums have practically the same agglutinating property. We therefore conclude that the serum diagnosis of tuberculosis, and especially for the early diagnosis of tuberculosis, is of no value.

THE CLINICAL, ANATOMICAL, AND PATHOLOGICAL COMPARISON OF TUBERCULOUS CAVITIES IN THE LUNGS.¹

BY H. R. M. LANDIS, M.D.,

DEMONSTRATOR OF MEDICINE IN THE JEFFERSON MEDICAL COLLEGE, PHILADELPHIA; VISITING PHYSICIAN TO THE TUBERCULOSIS DEPARTMENT OF THE PHILADELPHIA GENERAL HOSPITAL, THE PHIPPS INSTITUTE, AND THE WHITE HAVEN SANATORIUM,

THIS paper has been prepared with the view of reconciling some of the divergent views in regard to cavities in pulmonary tuberculosis, particularly from the standpoint of diagnosis. From its inception, it has been the custom at the Phipps Institute to bring before the members of the staff at its weekly meetings the results of each autopsy. Black-board diagrams of the clinical findings are made and these are then compared with the fresh anatomical specimens.

The 53 cases I have analyzed resulted in death during the year 1905. The autopsies were made by C. Y. White, pathologist to the Phipps Institute, and the clinical examinations by members of the house staff, numbering eight.

The opportunity which a large number of autopsies has afforded of verifying clinical findings has shown that errors are not infrequent. Thus, a cavity is diagnosed as being present which the postmortem fails to reveal, or a cavity actually present has escaped notice. The question of whether a lung contains a cavity is of considerable importance from the standpoint of prognosis. Small or fairly large cavities which are sharply defined, and especially if dry, make for a fairly favorable prognosis, while communicating cavities or single cavities with active constitutional symptoms render the prognosis grave. In any case, however, the prognosis should be guarded, owing to the possibility of a sudden and fatal hemorrhage. Quite recently I saw a man whose history indicated disease of some years' standing and who had in the apex of the right lung a large, quiescent cavity. He had a slight cough and some expectoration in the morning, but no other symptoms. A favorable prognosis was given, but he died suddenly one week later from a large pulmonary hemorrhage.

¹Read at the meeting of the National Association for the Study and Prevention of Tuberculosis, Washington, D. C., May 17 and 18, 1906.

The possibility of such an accident can never be guarded against, as it is well known that once an excavation has formed it is never obliterated. Furthermore, there is no means of knowing whether the bloodvessels have become completely thrombosed. Another menace to the individual with a cavity is the constant danger of mixed infection. Even under the most favorable circumstances these excavations are points of least resistance, and no lung containing them is as safe from outside influences as the one in which the infected area is firmly walled off by fibrous tissue. On the other hand, it sometimes happens that the patient's condition is improved by the formation of a cavity, for with the removal of a necrosed area an immediate improvement is noted in the constitutional symptoms. Such an individual, however, must always be subjected to the dangers mentioned above.

Perhaps, the most striking feature of tuberculosis of the lungs is the excavations which occur. In the chronic types this feature is present in the majority of cases. In the acute forms of the disease, in the so-called pneumonic and bronchopneumonic types, excavations are not unusual, particularly in the bronchopneumonic form, although the process may be so acute as to cause death before breaking down of the caseous area occurs. This is the type of the disease usually occurring in children and the majority of the lower animals. Even in general miliary tuberculosis excavations are not uncommon and in some instances must be looked upon as the infecting source of the generalized process.

I have heard it asserted that every case of tuberculous infection of the lungs develops some evidence of excavation, however small. Of 78 cases which Flint analyzed from this standpoint 62 showed cavitation; of the 16 without cavities, 5 were of the acute miliary type, leaving 10 of the more chronic forms in which no excavations had occurred. Of 53 cases examined at the Phipps Institute during 1905, 50 had well-marked cavities. The longer the tuberculous process lasts, no matter how slow its progress, the more certain is excavation to occur, although in very latent and chronic cases, so-called fibrous phthisis, the disease may last for years and at death show no evidence of cavity formation. In those types in which the tuberculous process, aided by mixed infection, pursues a more or less rapid course, excavations occur quickly. Cavity formation is usually a gradual process, at least so far as we are able to judge by physical signs. Occasionally, however, the excavation is formed suddenly, and in an area where consolidation had been noted for weeks the unmistakable signs of cavity may be detected.

The wall of a cavity consists of three parts: (1) A caseous lining in which all trace of lung tissue is lost and the margin of which toward the cavity is breaking down; (2) a zone in which early tuberculous changes, both interstitial and alveolar, are seen; and (3) an outside zone of small-celled infiltration (West). Similar changes may be

going on in adjacent caseous areas with communicating fistulous tracts, giving the lung a honey-combed appearance. Recently formed cavities have an irregular outline, are ill defined, the interior is ragged, and there is an absence of a distinct wall. Cavities of this description are met with in the more or less acute tuberculosis and in the chronic types in those portions of the lung where the disease is advancing. When the process is less acute, or has remained localized for some time, the outer zone of small-celled infiltration develops into more or less well formed fibrous tissue. When this occurs the caseous lining is less, as is also the area of tuberculous infiltration.

❧ Cavities which have existed for a long time develop a thick fibrous surrounding and the caseous lining gradually changes into granulation tissue, which is in turn replaced by fibrous tissue, giving the interior a smooth lining. Secretion then ceases or nearly so, and the cavity is designated dry or quiescent. Various stages of this process are met with in chronic tuberculosis.

Cavities of any considerable size contain in their walls or in the trabeculae transversing them, bronchi and bloodvessels. The latter in the chronic cases usually become thrombosed and obliterated, although even in these cases a fatal termination may be brought about by rupture of a small aneurysmal dilatation. In the destruction of tissue a number of bronchi are inevitably involved. As a rule, most of these bronchi are destroyed by the tuberculous process or occluded by the fibrous tissue. External communication is then brought about by the breaking down of the tuberculous process or by ulceration of the surrounding tissue, until a large bronchus with its thicker walls is incorporated in the diseased area. This being more resistant to the necrotic process, remains patulous. It is not, however, often that a cavity is drained by more than one or two such openings.

When a number of such areas remain patent or when the opening is single and small, the physical signs are imperfect; to this fact must be ascribed the failure in some instances to recognize excavation.

According to West: "In the more acute cases there will be a larger amount of caseous material, more bacilli as a rule, and a greater likelihood of fragments of lung tissue. In the more chronic cases the amount of pus is larger, and it is observed in the sputum that the amount of pus and the number of bacilli often stand in inverse proportion to each other."

To Louis we are indebted for the observation that when tuberculosis attacks the lungs it almost invariably involves the apices first. This fact was further elaborated by Kingston Fowler, who showed that it is not the extreme apex which is involved, but a point an inch to an inch and a half below the apex, and that after tending to spread backward the course of the disease is downward, the upper

lobe and apex of the lower lobe on the primary side being involved before the apex of the opposite side is attacked.

As excavation is the final stage in the tuberculous process, it is but natural to look for the evidence of cavity formation where the disease first appeared. In an analysis made by Ewart cavitation occurred at the apices, 282 times; the dorso-axillary region, 227 times; the mammary region, 189 times; the sternal region, 61 times; the base, 32 times.

The distribution in the 50 cases at the Phipps Institute was as follows: right upper lobe, 15 times; left upper lobe, 6 times; right middle lobe, 1 time; right lower lobe, none; left lower and both upper lobes, 1 time; left and right upper lobes, 30 times; giving a total of 76 cavities.

In this series there was no instance of a primary basic cavity. This condition is rare, occurring in less than 1 per cent. of cases. Basic cavities in association with apical disease, however, are not uncommon, particularly when the disease is advancing rapidly.

The size of the cavities ranged from that of a cherry (1 x 1 cm.) to involvement of nearly an entire lung. In estimating the number of cavities present, small communicating cavities have been considered as a single large excavation, recognizing, however, that communicating small cavities may originate separately and coalesce from ulceration of the intervening lung tissue, or they may be separate points of softening in a large caseous area. Clinically the effort was made to distinguish this type.

It is evident that a pulmonary cavity at the apex is almost certainly tuberculous, and with the presence of the bacilli is invariably so. In most cases of chronic tuberculosis there is a slight degree of dilatation and thickening of the bronchial walls, but it rarely happens that these dilatations are sufficiently large to give physical signs. In two of our cases cavity formation and marked bronchiectasis at the apex co-existed, giving the signs of a single large cavity.

Involvement of the pleura over cavities is very common. Dense pleural thickening occurred in 60 of 76 cavities we examined. In the chronic forms this thickening is almost constant. In acute forms of the disease and in the advancing areas of the chronic cases when the breaking down is rapid, ulceration through the pleura with a resulting pneumothorax is not unusual. I have met with several instances in which the pleura had been perforated by an ulceration, but the dense adhesions presented collapse of the lung. Rarely a cavity may ulcerate through the chest walls. In one case which I have seen this accident was prevented by a rib which had become markedly necrosed.

In comparing the clinical with the pathological findings in these 50 cases, it was found that of the 76 cavities present, 58 had been recognized, while 18 had escaped notice. The majority of the cavities

not recognized were very small; three of them, however, had attained the size of a lemon (4 x 5 cm.).

It is usually stated in the text-books that a cavity must have attained the size of an English walnut before it gives signs sufficient for its recognition. The situation of the cavity, however, has a more important bearing on its recognition than its size. If superficially placed just beneath the pleura, cavities the size of a cherry (1 x 1 cm.) will often give well-marked signs, while much larger cavities deeply situated with a thickened pleura and normal and infiltrated lung tissue about them, will escape detection.

In the 58 cavities which were correctly diagnosed, lack of expansion, retraction of the apex, and flattening of the chest wall anteriorly were the rule. Bulging or fulness of the chest wall over the site of the cavity was not met with, although I have seen this phenomenon once.

In those cases in which it could be elicited the tactile fremitus was exaggerated in 34 instances, and diminished in 13.

The percussion note had a tympanitic quality in 36; was dull in 16; hyperresonant in 3; and in 3 instances was of the cracked pot variety of tympany.

The breath sounds were noted as cavernous in 29; amphoric in 19; bronchial in 13; and distant and indefinite in 7.

There was an absence of rales in 9. When present they were noted as being fine and moist in 16; consonating in 17; and gurgling in 16.

Vocal resonance was exaggerated in 51 instances, and diminished in but 1. Whispering pectoriloquy was present in 53 instances and absent 5.

In 8 instances cavities were correctly diagnosed as being communicating; this was about one-fourth of those actually of that character. The diagnosis was based upon the breath and voice sounds having several points of maximum intensity, in conjunction with a large area of coarse bubbling rales with a metallic quality, and symptoms indicating a rapid destruction of tissue.

The physical signs over those cavities (18) which were not recognized were almost invariably dulness, bronchial breathing, increase in vocal and tactile fremitus, and absence of whispering pectoriloquy. Most of these cavities were found postmortem to contain thick, creamy pus. Failure in the others may have been due to a number of small openings rather than to one or two large ones. On this point, however, there are no notes.

In the 10 instances in which cavities were believed to be present, but which at postmortem were not found, consolidated tissue around a bronchus was the source of error in 5. In 1 there was no adequate explanation. In 4 the error was probably due to transmission of the amphoric breathing and whispering pectoriloquy from a cavity on the opposite side. In these 4 instances the supposed cavities

gave signs posteriorly only. Cavities as a rule give more marked signs anteriorly. Thus, of the 58 under consideration, the signs were present anteriorly, or anteriorly and posteriorly in 55 instances, while but 3 gave signs posteriorly alone.

From this analysis it is evident that our results were not as accurate as they might have been, particularly in the estimation of conditions simulating cavity formation.

As far as the recognition of cavities actually present was concerned the results were fairly good, as the majority of those escaping notice were very small and the conditions found postmortem, in a measure, explained the cause of failure.

Basing the value of the various signs on the frequency with which each occurred, the following results were obtained: whispering pectoriloquy, 55 out of 58; tympany, 39 out of 58; cavernous or amphoric breathing, 38 out of 58; gurgling or consonating rales, 33 out of 58. While whispering pectoriloquy was most frequently met with its value is somewhat impaired by its absence in cases of well-marked cavitation, and also by the fact that its presence occasionally leads to a diagnosis of cavity when other pathological conditions, notably consolidation about a bronchus, are the real causes.

In conclusion, it may be said that any one of the above signs is suggestive of a cavity and that the probability of its existence is increased by the combination of any two or more of them.

STATISTICS OF DIET IN SANATORIA FOR CONSUMPTIVES.¹

BY IRVING FISHER, PH.D.,

PROFESSOR OF POLITICAL ECONOMY IN YALE UNIVERSITY; SECRETARY OF THE NEW
HAVEN COUNTY (CONNECTICUT) ANTI-TUBERCULOSIS ASSOCIATION.

HITHERTO, the chief weapons used in fighting tuberculosis have been fresh air and rest. But in such a desperate combat, every available weapon should be used—regularly graduated exercise, massage, hydrotherapy, mental diversion and suggestion, and last but not least, diet. Diet, however, while doubtless one of the most important agencies for the restoration of the consumptive's health, is also probably the most obscure and difficult of application.

The theories of diet in relation to tuberculosis are numerous and conflicting. Some authorities still cling to whiskey; most advocate meat, but there are a few whose experience has led them to discard meat; some emphasize the importance of cooking meat thoroughly, others maintain that it should be taken raw; eggs are recommended by

¹ Read at the meeting of the National Association for the Study and Prevention of Tuberculosis, Washington, D. C., May 17 and 18, 1906.

some and rejected by others; and the same conflict of opinion exists even as to milk, potatoes, other vegetables, fruits, nuts, etc. There are those who have a theory that tuberculosis is first of all a disease of general malnutrition, and can be cured by a general diet aimed to restore the powers of digestion and assimilation; others maintain that for the cure of tuberculosis a *specific* diet is needed, for instance, blood serum or mineral salts. Until recently forced-feeding was the rule. The wisdom of this, however, is now also called in question. It is usually assumed that the consumptive needs a large amount of proteid, but there are experiments which have tended to show that excessive proteid is injurious, not only to the healthy man, but even more so to the tuberculous invalid. Again there is a belief that consumption is largely produced by the omission of fat from the diet, and is to be cured by inducing the patient to consume large quantities of emulsion. Others maintain that the aversion to fat which is alleged to precede consumption, if it exists, is due to a deficiency of gastric juice, and that the consumptive instinctively avoids fat because it tends to restrain the secretion of such small amount of juice as the stomach is able to produce.

It is evident, therefore, that the subject of diet in tuberculosis requires much study. I disclaim any special knowledge, and the present paper aims merely to present statistics of existing methods collected for comparative purposes.

Letters of inquiry were sent to 95 of the leading sanatoria of the world, of which 63 were in the United States, 2 in Canada, 13 in Germany, 11 in Great Britain and Ireland, and the remainder in France, Austria, Norway, Switzerland, and Russia.

Very few supplied any measured data. In most cases the statement of the food consumed was given only in a general way. Tables I and II give the data received which are not in measurable form, so far as they seem in the least noteworthy. Some remarks have been omitted in the belief that those from whom they came might object to seeing them in print. Two sanatoria (one American and one German) replied that they could not regulate their patients' diet, because their patients were able to pay well and expected to get what they wanted to eat! Some sanatoria which replied are omitted owing to the fact that their replies contained no data.

On the other hand, a considerable number of sanatoria had made an exact record of the diet used, or kindly took the trouble to do so expressly in order to answer my questions. On the basis of these measured data Tables III and IV have been calculated, in which are incorporated also such measured data as I have chanced upon in various publications.

The first comment which naturally occurs to one who reads these four tables is that in most cases the foods employed are simply the foods in common use in the country or place where the sanatorium

TABLE I.—UNMEASURED DIET (AMERICAN). (ARRANGED IN ALPHABETICAL ORDER OF LOCATION).

Institution.	Location.	Physician in charge.	Food.	Meals. ¹	Remarks
Maryland St. Hospital.	Baltimore.	Louis Hamman.	Ordinary.	3 (+2)	"As liberal supply as they can manage."
Montefiore Home.	Bedford Sta. N. Y.	L. Rosenberg.			Moderate force-feeding.
Boulder Sanit.	Boulder, Col.	W. H. Riley, (formerly). (No longer takes the cases.)	Meat sel-dom.		High proteid. Moderate calories. Meat only when other proteid not relished. Usually those who tired of other proteid also tired of meat.
Kings Co. Hos-pital.	Brooklyn, N. Y.	J. F. Fitzgerald.	Ordinary.		Some force-feeding.
Brooklyn Home for Cons.	Brooklyn, N. Y.	E. Reynolds.			All stages. Uses oils combined with corn syrup, gets more wgt. gaining than when uncombined.
Nordrach Ranch	Colorado Springs.	Jno. E. White.	Milk the staple.		Force-feeding. One man took 29 glasses of milk a day.
Pembroke San.	Concord, N. H.	H. T. Fontaine.			Force-feeding.
Nat. Jewish Hospital.	Denver, Col.	M. Collins.	Ordinary (much fat).		Reaction against force-feed-ing, causes stomach trouble. Individualizes.
Y. M. C. A. Health Farm.	Denver, Col.	Jno. Wethered.			Opposed to force-feeding.
Hotel Dieu (Sisters' Hospital).	El Paso, Texas.	Outside physi-cians	Ordinary.		
U. S. Gen. Hos-pital.	Ft. Bayard, N. M.	Geo. Bushnell.	Ordinary.		Amount consumed limited only by capacity and desire.
Sanit. Gabriels	Gabriels, N. Y.	W. H. Clancy.	Ordinary.	3 (+3)	Force-feeding.
Muskoka Cot-tage San.	Graven-hurst, Ont.	J. H. Elliott.			"We constantly see cases of tuberculosis in which there is a steady gain in weight from week to week though a small amount of food is taken."
Muskoka Free Hospital.	Graven-hurst, Ont.	E. D. Parfit.	Ordinary.	3 (+2)	
State Hosp.	Howard, R. I.	F. B. Jewett.	Ordinary.		Moderate force-feeding.
Stony Wold San.	Lake Kush-aqua, N. Y.	H. S. Goodell.			Mixed diet, preponderance of proteid and fat.
Loomis Sanit.	Liberty, N. Y.	Dr. King.	Ordinary.	3 (+3)	Considerable fruit. Few nuts.
Pottenger San.	Monrovia, Cal.	F. M. Pottenger.			Reaction against force-feed-ing.
South Mt. Camp San.	Mont Alto, Pa.	A. M. Rothrock.			No restraint on amount of food. Believes, however, in limiting proteids.
Seton Hospital.	N. Y. City.	E. C. Garlock.	Uses beer.	3	
St. Joseph's Hospital.	N. Y. City.	C. M. Cauldwell.		3 (+2 or 3)	Includes cod-liver oil and maltzyme.
Grand View Inst. for Cons.	Oil City, Pa.	H. E. Kirshner.			Average diet consists of 6 or 8 raw eggs, 2 qts. milk and full meal at dinner time. Patients often gain better upon three meals than when two lunches are added. Also some gain better taking 6 eggs than when they have been given as high as 16 in a day.
Ottawa Tent Colony.	Ottawa Ill.	J. W. Pettit.	Ordinary; + nuts.	3 (+3)	Applies domestic science and balanced bills of fare.
R. I. State San.	Pascoag, R. I.	H. L. Barnes.	Ordinary.	3	
Phila. Gen. Hospital.	Philadel-phia.	Wm. B. Stan-ton.			Much liquid, 3 qts. milk, 6 raw eggs and 1 full meat meal daily.
N. Y. State Hospital.	Ray Brook.	Burnham.			Force-feeding.
Mass. State San.	Rutland, Mass.	W. J. Marclay.	Ordinary.	3 (+3)	Reaction against force-feed-ing.
West Mt. San.	Seranton, Pa.	J. M. Wain-wright.			Force-feeding.

¹ The numbers in parentheses are extra lunches additional to regular meals. These extra

TABLE I.—(Continued).

Institution.	Location.	Physician in charge.	Food.	Meals. ¹	Remarks.
Sharon San.	Sharon, Mass.	W. S. Griffin.			Moderate force-feeding.
New Mexico Cottage San.	Silver City, N. M.	E. S. Bullock.		3	Least to gain weight, ideal is 20 lbs. above normal, av. gain 30 lbs. High nitrogen. Reaction against over-feeding, individualizes.
Mt. St. Rose San.	St. Louis, Mo.	Wm. Porter.	Ordinary.		Individualizes.
Washington Asylum	Washington, D. C.	L. F. Zinkhan.		3	Much fat.
Sunnyrest San.	White Haven, Pa.	E. Stockdale.	Ordinary; + fruit and nuts.	1 (+5)	Large gains in wgt. Finds that any one can take milk and eggs granting they are the right quality

TABLE II.—UNMEASURED DIET (FOREIGN). (ARRANGED IN ALPHABETICAL ORDER OF LOCATION.)

Institution.	Location	Physician in charge.	Food.	Meals. ¹	Remarks.
Tonsaasen	Christiania, Norway.	Andvord.			Against force-feeding. Patients should "reduce outgo instead of increase income," i. e. rest instead of overfeed.
Turban's San.	Davos-Platz, Switzerland.	S. Turban.			Force-feeding.
San. Brehmer	Goerbersdorf, Germany.	Von Hahn.		5	Force-feeding. Proteids and fats.
Institut, für Pharmakol und Physiol. Chem.	Rostock, Germany.	R. Robert.			No restriction in diet.
Römpker's San.	Goerbersdorf, Germany.	Th. Römpker.			
San. Grand Hotel.	Leysin, Switzerland.	Echaquet.			Seen many digestions ruined by over-feeding, yet patients without appetite should be urged.
Mt. Vernon Hospital.	London.	T. N. Kelynaek.			Individualizes.
Nordrach Colonie	Nordrach, Germany.	Otto Walther.			Minimum diet for weight gaining. Individualizes. Some hardly any meat, others much. "Av. 1-5 meat and albuminous, 1-5 fat, 3-5 farinaceous, ordinary diet about 15% proteid, 35% fat."
Kremser San.	Sulzhayn	Kremser.	Ordinary.	3 (+2)	"I absolutely disagree with the general super-alimentation practised in many sanatoriums—my experience proves that an over-feeding has not the least favorable effect on weight gaining, but that the chief point is, to keep the proper balance in the composition of the diet, i. e. proteids, fat and carbohydrates, like 1:3 resp. 1:4 1-2."
	St. Petersburg, Russia.	Simon de Entenberg.			Much meat. Opposed to diet regulation.

¹ The numbers in parentheses are extra lunches additional to regular meals. These extra lunches usually consist of milk and eggs.

TABLE III.—MEASURED DIET. (IN ORDER OF QUANTITY OF FOOD USED.)

Institution.	Location.	Physician in charge.	Food and number of meals.	Proteid.	Fat.	Carbohydrate.	Total calories.	Remarks.
Roten Kreuz San.	Grabow-see, Germany.	Werner.		1200	2200	2100	5500	
Maine San.	Hebron, Me.	Estes Nichols.	Ordinary.	840	1900	1640	4380 ¹	Does not include extra eggs and milk.
Post Graduate Annex.	N. Y. City.	Jno. F. Russell.		510	2165	1565	4240	Average diet under rest treatment. Uses glycerin, calcium, chloride and cathartics systematically; ambulant cases use more food; in selected cases discards meats.
		Forrest treatment only milk, bread, butter, emulsion, and vegetable juice. In all cases excludes alcohol, tobacco, tea, coffee, chocolate, cocoa, beef-tea, meat extracts, meat juice, and vinegar.						
Rekneas San.	Kristiana, Norway.	Edw. Kaurin.		820	1860	1470	4150	
Royal Nat. Hos. for Cons.	Ventnor, Isle of Wight.		Ordinary.	700	1660	1640	4000	Average diet.
Agnes Memorial San.	Denver, Col.	G. W. Holden.	Ordinary; 3	830	1665	1470	3965	Greater gains of weight on 3 than on 5 meals.
Reception Hos.	Saranac Lake, N. Y.	E. R. Baldwin.	Ordinary; 3 (+2)	650	2000	1250	3900	
Millet San.	East Bridge-water, Mass.	C. S. Millet.	Ordinary. 3	600	1500	1450	3550	Average 4 days one patient.
Gaylord Farm San.	Wallingford, Conn.	D. R. Lyman.	3	530	1480	1540	3550	No force-feeding except in special cases. Most are restrained from over-eating. Average gain in weight of of the 10 discharged cases whose average diet was given was 19 lbs. in from 3 to 6 months, varying from 13 to 22, proteid from 340 to 630, fat from 1100 to 2000, and the calories of the ten varied from 2700 to 4100. These ten cases were heavier eaters than the average. They had 3 meals and one or two glasses of milk between meals. No extra eggs. 7 were males, 3 females. 5 were at or above their normal weight when discharged (by insurance tables) five below.
Pine Ridge Camp.	Providence, R. I.	W. H. Peters.	Ordinary.	900	1700	900	3500	Fairly early, weight gaining cases.
U. S. Pub. Health & Marine Hos. Ser.	Ft. Stanton, N.M.	P. M. Carrington.		650	750	1900	3300	Based on standard diet of U. S. Health & M. H. Serv. with addition of milk and eggs.
Stadt. San.	Munich.	Filler.		570	1130	1570	3270	If necessary.
			Ordinary.	500	1320	1230	3050	"Journal of the Outdoor Life," January, 1906.

¹ Amount administered at first.² Amount administered during convalescence.

TABLE III.—(Continued).

Institution.	Location.	Physician in charge.	Food and number of meals.	Proteid.	Fat.	Carbohydrate.	Total calories.	Remarks.
		Goodbody, Bardswell & Chapman.		480	1300	1220	3000	Most suitable diet for tuberculosis, <i>Med. Chir. Trans.</i> , vol. lxxxiv, 1902, pp. 119-120.
			Nuts, fruit and grains, exclusively.	370	870	1600	2840	Proposed in "Good Health," 1905, by Dr. Herbert Ossig.
San. Falkenstein.	Falkenstein, Germany.	Besold.		530	1120	1050	2700	Opinions on superalimentation agree with Dettweiler, his predecessor. Chief aim should be not to make patient as fat as possible and "one never can expect a patient to be the more resistant to disease the fatter he is or becomes." Superalimentation only needed to compensate the loss of proteids and fats, especially needed in feverish cases. In later cases much fat given. In other cases individualizes the diet by weighing the patient.
							3400	
							2000	
Winyah San.	Asheville, N. C.	Von Ruck.	Ordinary.				2500	Digestive complications determined by laboratory examinations. For weight gaining, fats and carbohydrates predominate.
		Burton-Fanning.	Ordinary; 3+ (3); few vegetables.	500	1100	900	2500	See his "Open-air Treatment of Tuberculosis."
Brompton Hos. for Cons.	London.	Williams.	Ordinary.	410	820	1170	2400	Average diet.
	New York.	W. H. Porter	Excludes potatoes, cereals, fruit, nuts, pastry, most vegetables, soups.	610	970	560	2140	"American Medicine," Sept. 20, 1902.

is situated. Almost any article of food, however deleterious in the estimation of physiologists, can be found in the lists supplied, such, for instance, as wine, beer, vinegar, pickles, catsup, fried food, pork, sausage, tripe, tea, coffee, gingerbread, pastry, etc. On the other hand, some of the sanatoria have taken particular pains to exclude foods regarded as deleterious, or to make extensive use of foods regarded as specially beneficial, aside from eggs and milk, which are, of course, a very common mainstay. Thus, a few make special use of nuts and fruit; others, cod liver-oil; others, Russell's emulsion, peptol, corn-syrup and oil, malted nuts, maltzyne, vegetable juices, etc. Most institutions probably make a point of excluding alcohol;

others bar out tobacco, tea, coffee, chocolate, cocoa, beef-tea, meat extracts, meat juices and vinegar; a few exclude meat; and one combines with forced-feeding a systematic use of cathartics.

In regard to the question of the quantity of food consumed, out of the 65 institutions tabulated, 28 were distinctly in favor of the system of forced-feeding, and 20 were distinctly reactionaries against it. Among the latter are some of those who have had the widest experience. In the table of measured data it will be seen that the dietaries range all the way from 2100 calories to 5500—a range of 160 per cent.

TABLE IV.—COMPARISON OF THE CALORIC VALUE OF THE DIET AT DIFFERENT SANATORIA.

INSTITUTION	CARBOHYDRATE	FAT	PROTEID	TOTAL CALORIES
ROTEN KREUZ SAN.	2100	2200	1200	5500
MAINE SAN.	1640	1900	840	4380
POSTGRAD. ANNEX	1565	2165	550	4280
REKNEAS SAN.	1470	1860	820	4150
ROYAL NATIONAL HOSP.	1640	1660	720	4020
AGNES MEMORIAL SAN.	1470	1665	830	3965
RECEPTION HOSP.	1250	2000	650	3900
MILLET SAN.	1450	1500	800	3850
GAYLORD FARM SAN.	1540	1480	530	3550
FINE RIDGE CAMP	900	1700	900	3500
U. S. PUBLIC HEALTH & MAR. HOS.	1900	750	650	3300
STADT SAN.	1570	1130	570	3270
"OUT DOOR LIFE"	1230	1320	500	3050
GOODBODY	1220	1300	480	3000
OSSIG	1600	870	370	2840
SAN. FALKENSTEIN	1050	1120	530	2700
BURTON FANNING	900	1100	500	2500
BROMPTON HOSP.	1170	820	410	2400
PORTER	560	970	610	2140

Naturally, not all of these standards can be correct, and if we are to believe that there is any virtue in "physiological economy" we must conclude that those sanatoria which use the lowest standards consistent with weight-gaining must be more nearly on the right track. It may well be, however, that the minimum standard used in one sanatorium could not be employed in another without a corresponding change in the character of the foods used, or in the proportions of proteids, fats, and carbohydrates. One physician who has done much intelligent experimenting found that less food was

necessary when bread and butter were added to a diet which previously had consisted of milk and fats exclusively. Two report that patients often gain better on three meals than on five or six, and one states that six eggs a day often produce better gains than sixteen. In one case, the patients are usually advised against eating as much as they would if left to their own devices. The weight-gains in this place average nineteen pounds in from three to six months. In this same institution it has been found that a prime factor in weight-gaining is the palatability of the food.

On the basis of the tables, we may feel considerable confidence that, given proper foods and proper proportions of food elements, the average tuberculous patient can be successfully nourished on 3000 calories or less per day, in other words, on *no more than is usually consumed by the ordinary sedentary man*. It is also extremely probable that seldom can less than 2000 calories be employed without loss of weight. There will doubtless be found considerable variation between 2000 and 3000, due to differences in the weight of the patients, differences in activity, powers of assimilation, and the extent of the disease.

Hitherto there has evidently been too much ambition to produce large gains in weight. This ambition is doubtless responsible in large measure for the extremes to which overfeeding has been practised. Weight-gaining, purchased at the cost of strain on the physiological machinery, is of very doubtful value, and it may be especially questioned whether the overfeeding practised *during convalescence* or after the patient is apparently cured, cannot be entirely dispensed with. The experiments, in England, of Doctors Goodbody, Bardswell, and Chapinan show that overfeeding healthy individuals produces weight-gaining, but injures their health and fitness for work. The comment of an observing physician to me on patients discharged from a large and celebrated sanatorium was that they were fat, but weak.

It has hitherto been the fashion to advise patients, when leaving a sanatorium, to maintain their weight above the normal, the belief apparently being that the surplus would stand them in good stead in case of a relapse. But it may well be that relapses themselves are made more probable by the attempt to maintain and carry surplus weight, and the consequent daily tax on the powers of digestion and assimilation to maintain this unnatural state. Assuming that the observations of Goodbody, Bardswell, and Chapinan apply to the discharged patient, we may well ask whether the attempt to maintain their weights above normal is not a chief cause of the tendency of the disease to recur. The discharged patient, ambitious to resume his former work, must be considerably handicapped by attempting at the same time to remain fleshy, especially if, as is usually the case, his digestive powers are naturally weak. His working power must needs be impaired, and the danger of working beyond his strength

is naturally increased. One patient, for two years after his first attempt to resume work following recovery from tuberculosis, was decidedly below par in his working efficiency. It was only after practising the "physiological economy," demonstrated and advocated by Professor Chittenden, and losing twenty pounds of useless weight that he was able to reach or surpass his former working power.

This physiological economy does not, however, consist entirely, or even principally, in the reduction of the total food value. Professor Chittenden has shown that the dietetic sin of the ordinary healthy man consists principally in too high a consumption of proteid, and the question arises whether the same may not be true in the treatment of tuberculous invalids. The evils from using excessive proteid, in the case of healthy men, have been very thoroughly proved by the work of Professor Chittenden. I have also confirmed them by a collection of statistics gathered from physicians, physiologists, and experimenters with diet to the number of many hundreds of cases. Among these are included a squad of nine students at Yale who have been experimenting on this line. Their experience shows that physical and mental endurance are immensely increased by a reduction in the amount of proteid ordinarily consumed.

In the case of the tuberculous invalid, the proteid required is evidently greater than for the healthy man. Tuberculosis, being a wasting disease, should naturally require much material for repairs. But the work of Chittenden and Folin has shown that the proteid requirement is so much within the ordinary proteid consumption, that even were it found that the tuberculous invalid *requires* double or treble the amount *required* for a healthy man, he would still be far from requiring the amounts which are often fed to him. The tables which have been presented show a wider range in the amount of proteid used than even in the total calories. The proteid ranges from 370 to 1200 calories. The lowest of these is beyond the Chittenden requirement for the healthy man, which for a man weighing 140 pounds is about 210.

Hitherto there have been very few experiments to determine what the effect of an increase or decrease of proteid may be on the tuberculous patient. In one case a physician who had been feeding a patient 3000 calories a day, of which about 350 were proteid, found that the patient's symptoms improved under this diet, though his weight did not increase. Desiring to effect an increase of weight he attempted to increase the proteid, but this change instead of producing weight-gaining, seemed to raise the patient's temperature. Dr. J. H. Kellogg, of the Battle Creek Sanitarium, believes in a minimum proteid, about two ounces, or three in some cases (240 to 360 calories), because (1) consumptives often lack gastric juice and pepsin, (2) proteid in excess is quickly oxidized and adds to fever if already

present, (3) proteid in excess leaves waste products, and (4) proteid in the form of meat has toxins already formed.

If the principle of physiological economy is sound, the minimum proteid which will produce the necessary repairs is the best amount to be administered. Anything below this minimum will of course lead to disaster. Physicians have rightly tried to be on the safe side, but have usually left a much larger margin of safety than is necessary.

Burton-Fanning says that the secret of feeding the consumptive is summed up in the word "accuracy." To obtain this accuracy—to achieve physiological economy and at the same time full nutrition—a careful and measured study of diet is needed. Fortunately, today such measurement is possible, and far easier than a few years ago. I have attempted to show¹ a simple method by which a patient's diet may be recorded and regulated without any personal annoyance or anxiety on his part.

An examination of the preceding tables will show that not only proteids but also fats and carbohydrates vary widely. In one case the fat alone amounts to 2200 calories, or as much as the total food in some institutions. In another case it is as low as 750.

When the questions of the quantity of food and the proteids, fats, and carbohydrates are settled there will remain the question of what kinds of foods are best. We need facts as to the effects on tuberculosis of alcohol, tobacco, tea, coffee, pepper, vinegar, spices, oils, emulsions, vegetable juices, and even meat, eggs, and milk. Not one of these should be accepted as the best or as a universal food in tuberculosis, except provisionally.

The question of meat is closely bound up with the question of proteid, for the quantity of proteid will usually vary with the quantity of meat. But meat should also be considered apart from the question of proteid. It would appear that the sole virtue of meat not possessed by other ordinary proteid food, lies in the fact that it is highly peptogenic. Pawlow found that meat was more highly peptogenic than any other food with which he experimented. Chemical analysis has shown that meat is deficient in mineral salts, that eggs, milk, and vegetables contain more iron, as well as all other minerals, than does meat.

The suggestion that meat possesses a serum virtue, specific in the treatment of tuberculosis, is apparently as much without experimental verification as, a few years ago, the suggestion that urea is a specific in tuberculosis. In respect to digestibility, certain other forms of proteid, such as gluten, are superior to meat. The peptogenic virtue which meat possesses is evidently very greatly in its favor, especially in the treatment of tuberculosis. But the opponents of meat point out that the peptogenic effect is secured at the expense of introducing into the system poisonous waste products. It would seem to follow from this that if a sufficient stimulus to the secretion

¹ Amer. Jour. Physiology, April, 1906.

of gastric juice can be secured without the use of meat there will result physiological economy.

If meat is to be used, a subsidiary question arises whether it should be cooked or raw. Richet and others have advocated raw meat, and have seemed to base their conclusions on experimental evidence, but the check experiments of Dr. Brown at Saranac Lake have failed to confirm Richet's conclusions.

Finally, it is doubtless of the highest importance to individualize the diet. This has been emphasized in many of the replies, though oddly enough, some who have most emphasized the necessity of individualizing the diet have urged it as an argument against a measured dietary. It is, of course, true that if an accurate adjustment of diet to individual needs is to be sought, even greater importance attaches to the measurement of diet than would be the case if a single diet would suffice for all patients. In order suitably to adjust the diet to particular idiosyncrasies of the individual, the sanatoria might do well to make a systematic use of gastric analysis, in order particularly to determine the amount of secretion of hydrochloric acid and pepsin. The results would give the physician a clue as to whether the patient needs a large amount of fat to repress the acid secretion, or will do better by substituting carbohydrates because of a deficiency, and also to what extent it is necessary to stimulate the formation of pepsin by means of peptogenic foods, such as meat and sweets.

But after all the measurements and adjustments have been made for the patient, it is doubtless true that much must be left to his own taste. The greatest service the physician can perform for his patient in the matter of diet is to normalize the food instinct so that the patient can be trusted to select his own food correctly. To this end it is suggested that experiments in careful mastication be made on patients in order that the taste may be given a longer period in which to judge as to its likes and dislikes. It was on this basis that I experimented on the squad of nine healthy Yale students. In their case the result in ten weeks was an instinctive lessening of proteid, especially in meat form, and an increase in endurance, as shown by gymnasium tests, amounting to over 50 per cent.

We conclude that there is as yet very little known with certainty as to the most efficient diet in the treatment of tuberculosis, or the extent to which the diet must be individualized. In order to determine either the standard or individual diet, much study and accurate observation are needed.

Hitherto, with a few notable exceptions, sanatoria have merely imitated the home table. But it is unscientific to follow current custom in food, and may be quite as disastrous to the patient as to follow current custom in ventilation. It is equally unscientific to follow dogmatic opinion of authorities, however eminent. No science ever made progress which depended on opinions. The only

tribunal in true science is the tribunal of facts, carefully arranged and sifted.

It will undoubtedly happen that in the next few years sanatoria and laboratories will provide the necessary observations. These observations should include observations on the consumptive's diet before entering sanatoria. Such data are now being collected by one institution, and will serve to determine the question whether fat is rejected by consumptives as a rule. When the needed data have been obtained and interpreted, the question of diet will have been raised out of the realm of opinion to the plane of verified fact.

THE RELATIVE VALUE OF THE HOME TREATMENT OF TUBERCULOSIS.¹

BY LAWRENCE F. FLICK, M.D.,

DIRECTOR OF THE HENRY PHIPPS INSTITUTE FOR THE STUDY, TREATMENT, AND PREVENTION OF TUBERCULOSIS, PHILADELPHIA.

TREATMENT of tuberculosis is of very recent birth. To do something to make a tuberculous subject get well, actually to contribute something toward his recovery by any method other than change of climate, is a new concept, so new that very few physicians as yet grasp it. Such a treatment exists at present and is a valuable addendum to the armamentarium of the physician.

In the not very distant past there was but one course open to a tuberculous subject who wanted to save his life, namely, to change climate. This was called the climatic treatment, and whilst it did not save life very often, it did so sometimes when applied early in the disease. It was the only treatment in which the physicians and the people had confidence, and when it could not be applied the unfortunate victim was consigned to death on the slow, easy road of close confinement in a tightly shut room, with opiates, cod-liver oil, squills, tartar emetic, and patent medicines of every possible description. Sometimes the poor fellow got well in spite of this, and then the conclusion was reached that he did not have consumption.

Climatic treatment of tuberculosis in the sense here given has existed since the days of Hippocrates, and during all this time held out hope, but did not remove the stigma of incurability from the disease. The world believed that climate might cure tuberculosis, but unanimously gave the verdict that the disease was incurable. The idea of the curability came with the new treatment of the disease.

¹Read at the meeting of the National Association for the Study and Prevention of Tuberculosis, Washington, D. C., May 17 and 18, 1906.

Since the new treatment of tuberculosis has come into existence, we speak of two kinds of treatment, climatic treatment and home treatment. With most physicians and with all of the laity climatic treatment still has the old meaning of going away to get well, but with some physicians it has a new modified meaning, namely, of treatment according to modern methods in a selected climate. In this new sense it seeks to take in all that climate can give, as well as all that modern scientific methods can give. It is in this sense that I shall consider it in comparison with home treatment, and I do this in a spirit of fairness, inasmuch as in the old sense it was not a treatment at all.

Home treatment of tuberculosis is treatment of the disease in the home country of the patient; in other words in the climate in which the disease was contracted. It disregards climate altogether as a curative factor and tries to restore the patient to health with as little interference with home life as possible. It depends entirely upon science for its resources, that is, science in the broadest sense, exclusive of climate.

Both home treatment and climatic treatment may be subdivided into two kinds. Home treatment may be (*a*) in the home of the patient and (*b*) in a sanatorium; climatic treatment may be (*a*) in a hotel, boarding-house, or home of the patient, and (*b*) in a sanatorium. Both treatments may be carried on in cities or country districts and both may be given on mountains or at sea level.

Home treatment and climatic treatment differ in the following items: Home treatment is entirely devoid of the element of climate; climatic treatment depends somewhat on climate. Home treatment is free from the worries and cares caused by absence from home; climatic treatment always contains the element of being away from friends and relatives. Home treatment is much less expensive than climatic treatment, and does not break up business arrangements to the same degree as climatic treatment; in many cases it does not disconcert business arrangements at all. Home treatment then has everything that climatic treatment has except the climate, absence from home, heavy cost, and interference with business; climatic treatment has everything that home treatment has, plus the climate, absence from home, heavy cost, and interference with business. In other words, climatic treatment has both a positive and a negative element which home treatment is devoid of; otherwise they are nearly alike.

Let us weigh some of these elements which climatic treatment has and home treatment has not. Climate, of itself, as a curative factor in tuberculosis has never been defined, inasmuch as it eludes analysis. In the abstract it has been held of value, but all that it has been possible to say for it is that people have gone away and have gotten well. Modern investigation has proved conclusively that fifty per cent. of the people who have an implantation of tuber-

culosis recover without being conscious of having the disease. Many who stay at home recover, as well as many of those who go away. The go-a-ways usually are well-to-do people; the stay-at-homes are poor. A well-to-do go-a-way recovers and attracts attention; a poor stay-at-home recovers and is unnoticed, or if noticed is said not to have had consumption.

Spontaneous recoveries take place everywhere. We have no evidence that more take place in one climate than in another. In climatic resorts tuberculous subjects congregate, attract attention, and are under observation; when a recovery takes place it is noted, but when a patient goes home to die or is sent home in a coffin, no notice is taken of the matter. We have no statistics showing how many get well and how many die. In home climates things are reversed. Tuberculous subjects are scattered through the community and attract very little attention except when they die. Recoveries are never noted, but death always is. We have statistics of how many die but not of how many get well.

The only statistics bearing upon recovery from tuberculosis at our command at present are of a most general character and apply equally as well to the home as to climatic resorts. Autopsy records in different parts of the world show that, under the most conservative interpretation, fifty per cent. of all people who are born get an implantation of tuberculosis. As the percentage of people dying from tuberculosis varies from ten per cent. to twenty-five per cent. in different parts of the world, it is plain enough that the people represented by the difference between the percentage who get an implantation and the percentage who die must recover or at least die from some other disease. More than one-half of the people who get tuberculosis therefore recover, either spontaneously or through treatment. Unfortunately we have no statistics from health resorts showing what percentage of people who die have had an implantation of tuberculosis. Did we have even these we might be able to compare recoveries in health resorts with recoveries generally.

What does absence from home mean in the treatment of tuberculosis? Is it an asset or liability for recovery? Mental attitude undoubtedly plays a part in the treatment of tuberculosis. The best asset we have for recovery is good physiological metabolism. Just in proportion as a tuberculous subject becomes physiologically normal are his chances of recovery. He must eat well, digest well, oxidize well, eliminate well, and sleep well. Whatever interferes with any of these functions inhibits recovery. Homesickness interferes with some if not all of these functions, for a shorter or longer period according to the individual, and homesickness occurs in most people who go away from home. Besides homesickness we are to reckon with fatigue of travel, life in a boarding-house or hotel, and the difficulties of acclimatization as interferences with

normal physiological action. All of these are breaks upon smooth progress toward recovery, and one or the other may be the straw which determines the final outcome of the case.

Expense is an item which needs to be carefully weighed in the treatment of tuberculosis, as it may be the ultimate determining factor in recovery. Tuberculosis is a long drawn out disease even when the outcome is favorable, and whatever treatment is followed must be a long one. From the beginning, therefore, the cost of treatment should be kept in mind and so planned that it can be continued to a final issue. No matter how valuable a treatment may be temporarily, it is of no real value unless it accomplishes final recovery and a life of usefulness. Moreover, there must be something left for the patient to live on after he gets well. Recovery in tuberculosis is seldom so complete that the patient is free from tubercle bacilli absolutely, and as a rule good health continues only so long as the mode of life is followed which has brought back health. A cured consumptive, therefore, has a decreased earning capacity after recovery and has to live at a higher cost of maintenance.

For the average individual the expense of climatic treatment is prohibitive and even for well-to-do people it is often embarrassing. The expense therefore is an impediment to recovery, and should be well weighed in calculating the value of climate as an asset in the treatment of the disease.

Interference with business is also a liability in the account of climatic treatment of tuberculosis which cannot be lost sight of. A man will give anything to save his life, and when told by his physician that he must sacrifice his business and go away he usually does so unhesitatingly and without regard for the future. This very step, however, often means his own ultimate ruin and the undoing of his family. It even may have a damaging influence on the immediate course of his disease through the worry which it excites and the fatigue which it involves. Pulling one's self up by the roots, so to speak, and transplanting one's self into a new soil is not an easy matter and is necessarily accompanied by disappointments and heart-aches of many kinds. The financial loss involved in such a change often transforms a well-to-do family into an ill-to-do family, and leads not only to the death of the individual in whose behalf the change is made, but on account of the distress brought about, to the physical undoing of other members of the family. Here again we have a well-defined liability. The burden of this liability is very much increased by the traditional injunction of public opinion against the return of the "lunger" to his native land.

Having weighed those things in which climatic treatment differs from home treatment in tuberculosis let us see to what extent the other elements in the treatment of tuberculosis can be better applied

in the health resort than in the home of the patient. In order to be able to do this let us first carefully consider what the modern treatment of tuberculosis is. The treatment of tuberculosis as now followed by the most advanced workers in this field is a pretty exact science based upon principles well understood and correctly applied. These principles are: First, that, tuberculosis being a parasitic disease, cure takes place (*a*) through development of resistive and destructive forces within the body, and (*b*) through the introduction of such forces from without the body into the body; second, that the curative forces developed within the body, all other things being equal, are better than the curative forces introduced from without the body; third, that all living things have inherent phagocytic power which may be increased or decreased; fourth, that phagocytic power in the living organisms runs parallel with physiological competency of the organism. In other words, the cure of tuberculosis depends upon natural resources of the individual reinforced by extraneous forces properly and timely applied; and our capacity to cure the disease depends upon our skillful regulation of life so as to make available the natural resources and our timely application of artificial assistance.

Based upon the principles just laid down the modern treatment of tuberculosis consists: First, of a careful selection of diet; second, of regulation of exercise and rest; third, of regulation of mode of life; fourth, of medication; and fifth, of artificial immunization. In these five items we have a powerful armamentarium for the treatment of tuberculosis, and by their proper use we can cure every case of incipient tuberculosis and a very large percentage of even advanced cases. Every one of these items, however, is of importance and should be available for every patient if all is to be done for him which modern science enables one to do. To be able to use all of these resources requires careful expert training which few men as yet have.

It is not my intention at present to go into the details of the treatment of tuberculosis or to express any opinion on the relative value of the various resources at our command. I desire simply to compare the facilities for applying modern treatment of tuberculosis at home with the facilities for applying it in a health resort, and to determine the relative value of the treatment under the conditions. The question, then, is, Can the modern treatment of tuberculosis be applied better in the home of the patient than in a health resort, and in which are the conditions for the application of this treatment best and the ultimate outcome of the treatment most satisfactory?

I have already considered in a measure the relative influence of home life and health resort life upon the patient and have called attention to the drawbacks which absence from home places upon climatic treatment of tuberculosis. Let us now consider the relative

opportunities which the home and the health resort give to the patient for expert treatment. In the past when every health resort had a number of resident physicians, who, themselves had gone through an experience with tuberculosis and therefore had some knowledge of the disease, there were undoubtedly better opportunities in health resorts for getting expert treatment than in the homes of patients. This probably had something to do with the reputation which health resorts developed in the cure of tuberculosis. In those days there was no scientific treatment of tuberculosis and the man who had gone through a siege of the disease and had recovered was able to give better advice than the man who had not gone through such an experience. His knowledge was empirical and the value of his advice depended largely upon his personal equation. Now, however, with definite knowledge about tuberculosis based upon scientific principles and worked out along scientific lines, knowledge of the treatment can be given to anyone who has the intelligence to receive it and is willing to acquire it, and men may as well be equipped to treat the disease in the home of the patient as in a health resort. Indeed, in many ways the home physician, at least in large cities, may be better equipped because he has better opportunities for qualifying himself to make an early diagnosis, and successful treatment depends much upon early diagnosis. Physical diagnosis has been developed into a fine art, and it is within the power of most men with fair natural abilities to become experts to such a degree as to enable them to diagnose the disease before there is any broken-down tissue. To train an expert of this kind, however, is not an easy matter, and requires long service under a competent master with opportunities for careful comparison of physical signs with pathological findings. At present, therefore, the situation is somewhat reversed, and instead of finding the best trained experts for the treatment of tuberculosis in health resorts, with some notable exceptions, we find them in large centres of population; and the opportunities for getting expert treatment are perhaps better in large cities than in some of the health resorts.

The next question is, Can the modern treatment of tuberculosis be efficiently administered in a city or country, irrespective of climate? I unhesitatingly say it can, and I base this opinion upon a large experience under every conceivable condition. The results which have been obtained in the treatment of tuberculosis in sanatoria located irrespective of climate, in dispensaries, in city hospitals, and in the homes of the patients, during the last few years leave no doubt upon this subject. Men from all parts of the world who have had experience in home treatment of tuberculosis are unanimous upon this subject.

We have been able to demonstrate at the Phipps Institute, during the last three years, that the very best results can be obtained in the treatment of tuberculosis under most unfavorable conditions,

provided true scientific treatment is administered. A most striking illustration of the value of scientific treatment and complete control, as compared with climatic influence, has been brought out by the successful treatment of some cases at the Phipps Institute which had failed at the White Haven Sanatorium, although the two institutions are under the same medical director and the same medical staff. The only difference in the medical administration of the two institutions is that one is in the city, where the visiting physician has absolute control and where the most arbitrary discipline is in vogue, and the other is in the mountains, where the visiting physician goes at intervals of two weeks and where a greater latitude is given to the patients. Only advanced cases are admitted into the Phipps Institute and ostensibly those patients which are supposed to be in a dying condition, and yet recoveries take place there. The Institute is located amid the slums of Philadelphia and is conducted in an old building which prior to its present use had been idle for four or five years. The wards, moreover, are crowded and have to be ventilated by fans.

In conclusion, I wish merely to say that in comparing the home treatment with climatic treatment I have endeavored to be impartial and to express my convictions as based upon personal experience and general knowledge of the subject. I have no desire to prejudice health resorts nor to belittle what has been done by the men who reside in those places. If health resorts can produce better results than can be produced in the home of the patient, I am quite certain that the facts will be brought out by the many competent men who reside in those places, and anything which I can say will merely stimulate activity in that direction and help to bring out the truth and in no sense work evil to the cause. What we all want is the truth and it is incumbent upon each of us to speak honestly from his point of view. In my judgment the treatment of tuberculosis can be better carried on at present in the home of the patient, in those places at least where expert services can be given, than in a health resort. For people living in places where expert services cannot be had, it is undoubtedly better to go to a health resort than to remain at home.

THE ETIOLOGY, PROGNOSIS, AND INDICATIONS FOR THE SURGICAL TREATMENT OF TUBERCULOUS PERITONITIS.¹

BY RICHARD DOUGLAS, M.D.,

NASHVILLE, TENN.

ETIOLOGY. Frequency. In 1825, Louis pronounced the dictum that chronic peritonitis is usually of a tuberculous nature. There is peritoneal involvement in 20 per cent. of tuberculous subjects (Wathen). In 4250 autopsies, Borschke² found 1393 cases of tuberculosis; of these 226, or 16 per cent., showed evidence of invasion of the peritoneum. Sixteen per cent. perhaps correctly represents the frequency with which tuberculous peritonitis occurs in tuberculous subjects in general at autopsy. Taylor Cummins,³ reviewing 3405 autopsy records of the Pennsylvania, Philadelphia, and University Hospitals, found that 25.4 per cent. presented some type of tuberculosis. In addition, seventy-six records showed healed tuberculous foci. In 11 per cent. of the cases of tuberculosis there was peritoneal involvement. These are the "hard-worked statistics" referred to by Mayo,⁴ and really convey very little additional information to us, since it is well known that somewhat over 60 per cent. of general autopsies reveal tuberculosis, active or healed. In 5687 intraperitoneal operations at St. Mary's Hospital, Rochester, Minnesota, 3 per cent. were for some variety of tuberculosis. From 1889 to 1900, Shattuck⁵ found a record of 98 cases of tuberculous peritonitis treated in the hospital, in the medical and surgical sides.

Age. Tuberculous peritonitis is more frequently met clinically between the twentieth and the fortieth year; yet there are no exact limitations as to age. Fifty-six of ninety-eight patients studied by Shattuck were between the ages of fifteen and thirty. In children it is most common between the ages of two and four years. The common dicta regarding congenital tuberculosis are probably extreme. It is likely, however, that it is more common than is generally supposed. Miserocchi⁶ found measles or pertussis, or both, in the antecedents of 83 per cent. of 352 tuberculous children.

¹ Read at the meeting of the National Association for the Study and Prevention of Tuberculosis, Washington, D. C., May 17 and 18, 1906.

² Virchow's Archiv., 1892, Bd. cxxvii.

³ Tuberculous Peritonitis; a Statistical Review, University of Pennsylvania Medical Bulletin, December, 1905, vol. xviii, No. 10, p. 272.

⁴ Surgical Tuberculosis in the Abdominal Cavity, with Special Reference to Tuberculous Peritonitis, Journal of the American Medical Association, April 15, 1905, vol. xlv, No. 15, p. 1157.

⁵ Prognosis and Treatment of Tubercular Peritonitis, THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, July, 1902, vol. cxxiv, p. 1.

⁶ Abstract, Journal of the American Medical Association, April 30, 1904, vol. xlii, No. 18, p. 1115.

Rotch¹ gives some idea of its frequency in early life. He found that in eighteen years 69 cases were admitted to the Children's Hospital in Boston. Kissell² says that it is far more common in children than is supposed. In 883 collected autopsies upon tuberculous children, Biedert³ found peritoneal involvement in 18.3 per cent., paralleling in frequency its occurrence in adults.

Sex. The Mayos state that at the operating table they find about four females to one male with tuberculous peritonitis. Osler⁴ gives the ratio as 2 to 1. König⁵ collected 131 cases, 120 in women, 11 in men. This is quite a reversal of the old teaching from autopsy findings, as from them it is somewhat more common in the male sex. I rather think that this disproportion in favor of females has been exaggerated. When the element of sexual activity has been eliminated, as in children, we find it about equally distributed in the sexes, as in the 69 children so carefully studied by Rotch, 39 boys and 30 girls.

For adults the correct proportion appears to be about as Osler states, two females to one male. Kelly⁶ has shown that parturition is especially predisposing. On the other hand, hepatic cirrhosis, alcoholism, and tuberculous peritonitis are concomitant phenomena, more common in males, yet without any established sequence. Rotch and Mayo found a family history of tuberculosis in about 30 per cent. of their cases; other authors place it as high as 70 per cent.

The essential factor in the production of tuberculous peritonitis is Koch's bacillus; and as this parasite must be looked upon as a plant of relatively high development belonging to the actinomycetes, of the group of oospora, it would, therefore, deserve the name of *Oospora kochii* (Roger⁷).

In the histogenetic study it is necessary to admit such elementary facts as the following: The transmission of tuberculosis from animals to man has been demonstrated sufficiently. The question whether tuberculosis may be transmitted from the lower animals to the human subject by means of meat, milk, etc., has lately been much discussed. Koch, the leader of the negative school, is opposed by Hamilton,⁸ who has reinvestigated the subject, and he, with the majority of authors, now holds that tuberculous contagion is transmissible from man to man and from man to animals; from animals to man, and between animals of the same species.

¹ Tubercular Peritonitis, Journal of the American Medical Association, January 10, 1903, vol. xl, No. 2, p. 69.

² Vratch, St. Petersburg, June 1, 1901.

³ Jahrbuch f. Kinderh., 1884, xxi.

⁴ Johns Hopkins Hospital Reports, 1890.

⁵ Centralblatt f. Chir., 1884, No. 6, and Centralblatt f. Chir., 1890, No. 35.

⁶ Operative Gynecology, 1898, vol. ii, p. 134.

⁷ Infectious Diseases, 1903, p. 278.

⁸ Quoted by Walsham, loc. cit.

Tuberculous peritonitis is one of the manifestations of lesions due to the action of *Bacillus tuberculosis* through one of its many channels of infection. The oft-repeated statement that tuberculous peritonitis is always secondary, is practically the unchallenged dictum emanating primarily from such authors as Veit, Nothnagel, Teleky, Vierordt, and a number of recent writers.

In view of conclusive proof furnished by Walsham,¹ in his prize essay, issued by the Royal College of Physicians of London, I believe that evidence will soon be forthcoming that the peritoneum may, like many other structures in the body, be the primary site of lodgement of *Bacillus tuberculosis*.

In seeking to trace the channel of infection of the peritoneum, we must bear in mind that the tubercle bacillus is immobile; that it is of slow growth, and that it produces very varied tissue changes in places where it lodges (Walsham). The channels of infection by the tubercle bacillus are classified as follows: (1) Hereditary transmission; (2) lymphatic vessels; (3) bloodvessels; (4) epithelial channels; (5) inoculation into the skin or tissues. We know that tubercle bacilli can pass intact mucous membrane and epithelium, and there are undoubted instances in which, with a normal placenta, tubercle bacilli may be found in the placental blood and in the foetus. Chudovsky, in speaking of the etiology, says that there are cases known in which the foetus becomes tuberculous. Martin² took particles from the lungs of a six and a half months' foetus whose mother had died of tuberculosis and injected them into the peritoneal cavity of rabbits, with resulting death in four months. In another instance the blood from a five months' embryo whose mother had died of phthisis was inoculated into rabbits, with the result of tuberculous infection.

Schmoll³ and Birch-Hirschfeld⁴ found tubercle bacilli in the placenta and the capillaries of the liver in a child; the mother died of tuberculosis. Rindfleisch⁵ found tubercles in the lungs of a child eight days old; the mother was tuberculous. The above cases show that tuberculous infection may occur during intra-uterine life through the circulation. The foetus may be infected by extension of a tuberculous process in the tubes to the uterus and the foetus contained therein. The spermatic fluid coming from a diseased testicle or epididymis may convey the infection.

Cnopp's⁶ statistics show that out of 298 tuberculous children from a few days to twelve years of age no less than 147 had bone

¹ Channels of Infection in Tuberculosis.

² Quoted by Sir Dyce Duckworth, *Tuberculous Peritonitis*, *The Clin. Jour.*, London, 1903, vol. xxii, 209.

³ Quoted by M. Chudovszky, *Tuberculous Peritonitis*, *Pester Med.-Chir. Presse*, 1901, vol. xxxvii, No. 54.

⁴ *Ibid.*

⁵ *Ibid.*

⁶ Quoted by Walsham, *loc. cit.*

or joint tuberculosis. Only 8 of these showed evidence of visceral tuberculosis. Baumgarten¹ holds that the accidental conveyance of the tubercle bacilli to these parts would not account for such a large proportion of cases, and he expresses the view that the bacilli have been present since birth and have developed when the conditions became favorable. Mafucci² has shown that after infecting eggs with avian tuberculosis, the disease may remain latent in the chick for weeks or months; this is in support of Baumgarten's view, and these facts contain practically all that we can say upon the subject of inherited tuberculosis.

The process of eruption of metastatic tubercles is called hematogenous miliary tuberculosis. The blood channels have always been accredited with being a common mode of disseminating tuberculous infection. The bacilli may enter the blood current by way of the lymphatics, the thoracic duct, and the venous system, or they may gain entrance to the circulation through direct rupture of a bloodvessel. The small bloodvessels about an infected focus are always involved and become thrombosed; hence, they are not the carriers of the infection. As Weigert³ and Benda⁴ have shown, a general miliary eruption of tuberculosis is consequent upon tuberculous disease of the walls of the large bloodvessels. Under these circumstances, miliary tuberculosis may develop in the peritoneum, as in other organs or serous membranes.

The next path of infection that we shall consider is the lymphatic. Sydney Martin has shown that the bacilli can pass through healthy intestine to the mesenteric glands without leaving visible evidences upon the surface; or through open ulcers—an infrequent but well-recognized mode of infection.

Professor Benda, at the meeting of the British Congress upon Tuberculosis, spoke thus: "Whether tubercle bacilli can gain access through intact mucous membrane is a matter extremely difficult to determine by methods of pathological anatomy; we find a large number of bronchial glands tuberculous, in which we do not discover a trace of any bronchial lesion." Walsham says: "From some observations of my own upon tonsillar and intestinal tubercle, I believe that the tubercle bacillus can be passed through a normal intact membrane without showing the atrium of infection." Or, as Professor Hamilton expresses it, "Can the absorbents of mucous membrane seize upon the bacillus and hand it on to the corresponding lymphatics without becoming tuberculous?" He answers his own interrogation as follows: "My own impression is that they can; that the active point of invasion may, from local conditions, prove unfavorable to the development of tubercle and the bacillus

¹ Quoted by Walsham, *loc. cit.*, p. 29.

² *Ibid.*, p. 30.

³ *Ibid.*

⁴ *Ibid.*, p. 37.

is passed through them to a tissue more favorable for its growth." With this conclusion, Walsham agrees, after repeated observations upon tuberculous bronchial and cervical glands. He holds that it is certain that they receive their infection through the normal, intact epithelium of the trachea, bronchii, or oesophagus. The older theory that the bacilli pass through the lung and thus reach the bronchial glands is improbable.

It has been demonstrated by Dr. Litterer, of Nashville, Tennessee, that mesenteric glands may become infected through the intestines (proved microscopically and by guinea-pig inoculation) without lesion to the wall of the gut. A very interesting question, which he has been seeking to elucidate, is the possibility of primary infection of the peritoneum from the alimentary canal without involvement of the bowel wall, or of the mesenteric or retroperitoneal glands. In other words, can we have in this way a primary infection of the peritoneum? This has not been demonstrated; but there are many cases of tuberculous peritonitis in which it is impossible to discover a primary focus.

Reasoning by analogy from Walsham's investigation in infection of the bronchial and cervical glands, may not the infection reach the peritoneum through the normal bowel wall? It must be admitted that tuberculous peritonitis usually arises secondarily to tuberculosis of the pleura, abdominal or pelvic organs, so that the continuous extension of the process is clearly demonstrable. Sometimes, however, this relation cannot be traced; in which event, no doubt, the infection has been carried from some distant focus by the blood or lymphatic vessels.

In 226 cases of peritoneal tuberculosis, Borschke failed to find a primary focus in only 2 cases. The constancy of a primary source of infection in tuberculous peritonitis is noted by Primbram,¹ who states that out of 165 autopsies, 87 cases were attributable to intestinal tuberculosis, 65 to primary and glandular disease, 8 to tubal and uterine, and 5 to osseous tuberculosis. Taylor Cummins, who has studied this relation so closely, states that in his series of cases, 84 per cent. were complicated by pulmonary disease, and 32.6 per cent. by intestinal disease.

The female generative organs, especially the Fallopian tubes, may be the starting point of the infection to the peritoneum. From there the infection may be by direct inoculation or through the medium of the lymph channels. It has been said that postmortems upon females showed from 25 to 50 per cent. of tuberculous cases with tubal disease. Murphy² and Mayo believe that the common source of infection in females is the genital tract, especially the tubes. Osler considers tuberculous peritonitis in women a common

¹ Quoted by Taylor Cummins, *Tuberculous Peritonitis; A Statistical Review*, University of Pennsylvania Medical Bulletin, December, 1905, vol. xviii, No. 10, p. 272.

² *Tuberculosis of the Female Genitalia and Peritoneum*, American Journal of Obstetrics, 1904, vol. xlix, No. 2, p. 6.

sequence of tuberculous salpingitis. Upon the other hand, Williams¹ asserts that tuberculosis of the Fallopian tubes is far more frequently the result than the cause of peritoneal tuberculosis. That infection from without, through the genitals, is a mode of invasion seems established.

I have it upon the authority of Berkeley² that Morgagni, in 1744, was the first to record a case of genital tuberculosis. Literature is plethoric with the report of cases from Louis³ in 1825, to Pinner⁴ and Weigert in 1880, all taking the view that the infection is ascending; that is, from the genitals to the peritoneum. In 1880, Pinner found that powdered cinnabar placed in the peritoneum of rabbits could be found in the vagina in a very short time, being conducted from the peritoneum by the current of the tubal cilia; and it is presumed that in the same way tubercle bacilli can be wafted out of the peritoneal cavity into the genital tract. Of course, it is understood that they got into the peritoneal cavity by their natural carriers, the leukocytes, from the bowel or through the medium of the lymphatic channels from some primary focus, and it is remarked that, favoring this method of infection, the pelvis being the lowest portion, tubercle bacilli gravitate to that region.

The causal relation existing between peritoneal tuberculosis and tuberculosis of the genital organs is somewhat misty. For a long time it was believed, in obedience to Pinner and Weigert's theory of gravitation, that the peritoneum was the source of genital tuberculosis. Murphy, in contending for this theory of gravity, comments upon his experiments which appear to confirm it, as follows: "Tuberculous products placed in the peritoneum of the monkey settle in the pelvis and are not carried by the lymphatic current in the direction of the diaphragm." These conclusions run counter to Muscatello⁵ and Clark's investigations of peritoneal currents.

Against any theories we may entertain as to whether this infection is ascending or descending, is the clean-cut statement of facts by Mayo: "Having under observation a small number of patients in whom simple laparotomy had failed in the permanent cure of tuberculous peritonitis, we began to do a radical operation, performing hysterectomy with removal of the ovaries and tubes. The condition of the uterus and ovaries on examination did not justify so mutilating a procedure, the tubes showing unmistakable evidence that they alone were the source of infection. It became clear that in tuberculosis of the peritoneum, in a very large majority of women,

¹ Johns Hopkins Hospital Reports, 1892, vol. iii.

² Genital Tuberculosis in the Female, *Journal of Obstetrics and Gynecology of the British Empire*, January, 1903, vol. iii, p. 31.

³ Quoted by Berkeley, Genital Tuberculosis in the Female, *Journal of Obstetrics and Gynecology of the British Empire*, January, 1903, vol. iii, p. 31.

⁴ Quoted by Berkeley, *Ibid.*

⁵ Virchow's Arch., 1895, vol. cxliii.

a lupus of the mucous membrane of the tube was a source of infection to the peritoneum."

Mayo, dissenting from the idea of gravity advanced by Pinner and adopted by many, says: "The peritoneal involvement is greatest in extent near the seat of local infection. This has been generally noted, and heretofore ascribed to gravity. It is more likely due to the proximity to the seat of infection." I regret my inability to express myself definitely upon this very essential point. The question is raised, but unanswered by all of the three great classical writers upon genital tuberculosis, Berkeley, Williams, and Murphy.

Understanding the nature of the tubercle bacilli, it is quite reasonable to assume that the Fallopian tubes may become tuberculous by ascending infection from the lower genital or urinary tract; or from drifting bacilli in the peritoneum. The causal agent of tuberculous peritonitis, the tubercle bacilli, may infect the peritoneum from the tubes, through the medium of the lymphatics or by direct inoculation. Tuberculous peritonitis occurs from the male genital organs along the lymphatic vessels of the spermatic plexus or through the ampullar end of the vas deferens.

PROGNOSIS. Prior to König's first report in 1884, tuberculous peritonitis was regarded as an almost uniformly fatal disease when treated medically. The effects of the operative treatment have been to teach us that peritoneal tuberculosis is often present without producing special symptoms, and with a natural tendency to recover more often than is even now conceded. While the prognosis is not altogether bad, the gravity of an acute peritoneal infection, with or without recognizable primary lesion, cannot be overestimated. If we hold that peritonitis of this special variety is secondary to visceral or glandular infection, the peritoneal involvement may be arrested or controlled; but the ultimate prognosis will rest upon the activity of the primary lesion.

Peritoneal tuberculosis, appearing as a part of a general miliary tuberculosis, offers but little hope for even a temporary arrest. An acute peritoneal involvement, though localized, may become rapidly general and be attended with such toxic symptoms that we should regard it with the greatest apprehension.

While König taught us the value of the operative treatment he was among the first to advocate a selection of cases, and to condemn laparotomy as a uniform procedure in all types of peritoneal tuberculosis. Medically treated this affection is amenable to cure. Schröder¹ in his medical clinic obtained about 41 per cent. of cures. Rose,² who cites articles by Borchgrevink,³ who

¹ Quoted by Walsham, Channels of Infection in Tuberculosis.

² Mittheil. aus den Grenzgeb. der Med. u. Chir., 1901, Bd. viii.

³ Fall von anatomisch nachgewiesenes Spontanheilung der tuberkulösen Peritonitis, Deutsch. med. Woch., 1903, xxix, 43-45.

strongly advocates expectant treatment over surgical measures, gives these rather startling statistics: of 44 cases of tuberculous peritonitis 22 were treated by operation, with 64 per cent. of recoveries; 22 without operation, with 82 per cent. of recoveries, 68 per cent. of which were of over a year's standing. Spath¹ long ago advocated conservatism, but not to the exclusion of surgical treatment. Caille,² in a strong article, shows the futility of medical treatment of tuberculous peritonitis in children.

In uncomplicated subacute or chronic cases the outlook is distinctly favorable. In very young children with a strong inherited predisposition and severe infection the outlook is distinctly bad. The symptoms that affect the prognosis are: continuous fever, rapid wasting, persistent diarrhoea, and recurring exacerbations. The complications that make prognosis unfavorable are: pleurisy, localized suppurations, caseation of the mesenteric glands, and intestinal obstruction. Multiple sites of localization forecast a fatal ending.

The subacute and chronic ascitic forms are the most amenable to operative treatment. In only exceptional instances of complications and for the relief of special conditions should operation be undertaken in the fibrous form. The ulcerous form offers an unfavorable outlook, yet even these cases may eventuate in cure. After five different operations upon one patient, extending through a period of two years, I had the satisfaction of seeing absolute cure follow from drainage of many caseous masses; the patient is now a grown woman, in perfect health, and the mother of children.

All forms except the peracute are at least temporarily benefited, and a very conservative estimate of absolute cures can be placed at about 50 per cent. It will be a very difficult matter to eradicate from the active surgeon's mind these established benefits of the operative treatment of tuberculous peritonitis, and the day has not yet arrived when "surgery must hand back" serous tuberculous peritonitis to the internal medicine clinic with thanks for the splendid opportunity which a misunderstanding gave to the profession by means of laparotomy, to study tuberculosis in one of the large cavities of the body." (Borchgrevink, Fenger.)

CONTRAINDICATIONS TO OPERATION. In general miliary tuberculosis, medicinal hygienic measures should be employed. Dry, fibrous peritonitis presents the greatest difficulties in operation, and as it indicates a stage in the process of healing, surgical measures should not be employed except to meet complications, such as intestinal obstruction. In the ulcerous form, with great emaciation and prostration, operation is contraindicated. Lindfors holds that the co-existence of pleurisy darkens the prognosis. Active lesions in other parts are contraindications to operation. Intervention is

¹ Deutsch. med. Woch., 1889, No. xx.

² Archiv. Ped., July, 1900.

specially indicated when it appears that the peritoneal tuberculosis is the only active manifestation. In peracute cases, those of violent onset that resemble appendicitis or intestinal obstruction, the expectant treatment should be preferred to operation.

SURGICAL INDICATIONS. Fenger's¹ pronounced teaching against surgical interference in the ascitic form is met by the equally radical statement of Dennis² that tuberculous peritonitis has been taken out of the realm of internal medicine and transferred to clinical surgery. I must dissent from both these extreme views. If one author, Herringham,³ observed in the course of five years 25 cases diagnosed as tuberculous peritonitis, of which 19 recovered without operation and only 3 were unimproved; and if so careful a clinician as Shattuck is lead to conclude from an analytical study of 98 cases that tuberculous peritonitis under purely medical treatment may be followed by apparently complete recovery, even if complicated by tuberculosis elsewhere, we should surely hesitate before declaring this to be exclusively a surgical condition.

It is exceedingly fallacious to assume that the recognition of tuberculous peritonitis or a supposed diagnosis of that condition calls for immediate operation. In the exudative form we know that absorption takes place in those cases in which there is marked improvement in the condition of the patient; resorption of the exudate can only take place when the functions of the body are in vigorous activity. It is obvious, then, that should medical and hygienic measures fail to establish this standard of good health operative interference is demanded.

Too frequently it is stated that simple incision is sufficient. The exudate must be completely removed. In the early stage this is especially necessary, for if the peritoneum is not immune the retained bacilli and their toxin keep up the peritoneal inflammation and the ascites will, therefore, reform. So in chronic cases, if some of the fluid is left, although the peritoneum may be somewhat immune, the irritation caused by retained fluid will lead to a re-accumulation of the effusion. Obviously, then, laparotomy is necessary for complete removal of the exudate. All the fluid cannot be removed by mere puncture. Drainage is not desirable; indeed, it leads to infection and both tube and gauze drainage may produce fecal fistula. Neither is it shown that irrigation is essential. Efforts should not be made to detach adherent viscera further than to free encapsulated fluid or to relieve obstruction. Germicidal irrigations and local applications are of very doubtful value. Enlarged caseous mesenteric glands may be enucleated, though this is often a difficult task.

¹ Treatment of Tuberculosis of the Peritoneum, *Annals of Surgery*, 1901, vol. xxiv, p. 771.

² The History and Development of Surgery during the Past Century, *American Medicine*, February 11, 1905, vol. ix, No. 6, p. 227.

³ Quoted by Joseph Eichberg, Some Clinical Aspects of Tubercular Peritonitis, *Journal of the American Medical Association*, 1903, vol. xli, No. 41, p. 829.

Guided by the teaching of Murphy and Mayo, we all recognize the importance of removing foci of infection when possible. This should invariably be done when the appendix or Fallopian tubes is the source of supply.

If the serous covering of these organs shows miliary tuberculosis merely as a part of general peritoneal tuberculosis it is useless to remove them. It is well to follow the general law established by Ochsner, "Remove the tuberculous tissue if the section can be made through healthy parts." We should exercise the greatest care in all our intra-abdominal manipulations; avoid abrasion and injury to the serous covering of the viscera. The general conclusion is justified that tuberculous peritonitis can be cured by laparotomy. The unsuccessful cases are those that have advanced disease in other organs. The probable rationale of cure is that the manipulation and exposure cause an afflux of normal serum which is antitoxic. We should not hesitate to subject the patient to repeated operations if there is re-accumulation of fluid, especially if the first operation has been early in the progress of the disease.

OPERATIVE PROGNOSIS. Operative results give a recovery rate of from 25 to 30 per cent. The immediate operative mortality is but slightly over 3 per cent.; Mayo lost 3 cases out of 89. Cheyne says that in 385 operations 53 per cent. of the patients were well two years after operation. Rorsch¹ presents statistics of 358 patients treated operatively, 250 (70 per cent.) of whom were cured; 118 were under observation six months, 79 one year, and 53 two years.

Mayo contends strongly that tuberculous peritonitis has its origin in a local focus, and that the ultimate prognosis depends upon our ability to remove the primary site of disease. In 26 cases due to tubal infection in which he did the radical operation, 25 recovered. Several of these had had previous operation with recurrence. The prognosis after treatment by both medical and surgical methods, has been carefully studied by Shattuck. Out of the 98 cases treated the end-results are known in 57 cases; 25 of these were treated medically, the ultimate mortality which reached to a period of eleven years is 68 per cent.; 32 cases surgically treated, mortality 37.5 per cent. From these figures we learn that tuberculous peritonitis may recover under simple medical treatment; and evidence is not wanting to show that an anatomical restoration may be obtained.

Tuberculous infection of the parietal wound does not occur. Pyogenic infection is infrequent. A complication to be greatly feared is the formation of a fecal fistula; it will not occur in the ascitic form unless drainage is employed; it is especially likely to follow in the ulcerous form. The fistulae are very obstinate; in Czerney's clinic in 3 out of 4 cases he failed to close the fecal fistula by suture. I have had the same mortifying experience in 2 cases.

¹ *Revue de Chirurg.*, 1893, vol. xiii.

THE PROTECTION OF INFANTS AND YOUNG CHILDREN FROM TUBERCULOUS INFECTION.¹

By JOHN LOVETT MORSE, A.M., M.D.,

ASSISTANT PROFESSOR OF PEDIATRICS, HARVARD MEDICAL SCHOOL; ASSISTANT PHYSICIAN TO THE CHILDREN'S HOSPITAL AND TO THE INFANTS' HOSPITAL, AND VISITING PHYSICIAN TO THE FLOATING HOSPITAL, BOSTON.

FREQUENCY OF TUBERCULOSIS. Large series of autopsies in children under fifteen years of age show tuberculosis in from 25 to 35 per cent. Tuberculosis is very rarely found in the first three months (2 per cent. to 6 per cent.), increases rapidly in frequency during the rest of the first year, and steadily up to five years, after which the increase is slower, the percentage from this time on varying between 65 per cent. and 75 per cent.

Figures obtained in this way, however, do not give a true picture of the conditions among living children. The most reliable data on this point can be obtained from autopsies on children dead of the acute infectious diseases. The figures obtained in this way from large series in different cities show a frequency of tuberculosis varying between 16 per cent. in Boston and 24 per cent. in Prague.

FATALITY OF TUBERCULOSIS. While the frequency of tuberculosis increases with age, the fatality of tuberculosis diminishes steadily during the first two years, after which it remains nearly constant. In almost every case in which tuberculosis is found in the first six months it is the cause of death, while this is so in only three-fourths of the cases in the second six months, the proportion diminishing steadily with age. The fatality of tuberculosis in early life is due to the great tendency to dissemination at this age, active general tuberculosis being found in about 75 per cent. of the fatal cases, while nearly 60 per cent. die of tuberculous meningitis. Very little tendency to healing appears until the third and fourth years.

MORTALITY OF TUBERCULOSIS. The number of deaths from tuberculosis is almost nil during the first months of life, but increases progressively afterward, the increase being especially rapid from one to two years. The first maximum is reached between two and four years. After four years the mortality diminishes to puberty.

These facts justify the conclusions that tuberculosis is an extremely important and fatal disease in early life, well worthy of serious attention, and that it is almost never intrauterine in origin, but an acquired and hence a preventable disease. The malignancy of tuberculosis, the absence of any tendency to healing, and the great tendency to dissemination in infancy and early life are, moreover, extremely strong evidence against the verity of Behring's theory.

¹ Read at the meeting of the National Association for the Study and Prevention of Tuberculosis, Washington, May 17 and 18, 1906.

During infancy and early childhood, when the mortality of tuberculosis is greatest, the child rarely leaves its home. Later, when the child plays out more and goes to school, the mortality diminishes, showing that the danger of contagion is greater at home than abroad, and that, while all sources of contagion must be considered, our attention must be devoted especially to the prevention of domestic infection. Contagion alone is not sufficient for the development of tuberculosis; there must also be a favorable soil or predisposition. Measures for the prevention of tuberculosis in childhood should, therefore, be divided into two classes: those intended to diminish the susceptibility to tuberculosis, and those intended to prevent contagion.

SUSCEPTIBILITY TO TUBERCULOSIS AND METHODS FOR DIMINISHING IT. *Heredity.* While direct heredity, either from the sperm or through the placenta, practically never occurs, and although the children of the tuberculous if removed from their parents at birth do nearly as well as the children of the non-tuberculous, it seems safe to assume that a predisposition, or better, a diminished resistance, to tuberculosis is inherited. This susceptibility is probably greater than that transmitted by other debilitated or alcoholic subjects and different from the natural predisposition of early life. Exposure to house contagion is not sufficient in itself to explain the greater frequency of tuberculosis in the children of tuberculous parents.

Theoretically, marriage should be forbidden to the tuberculous, but practically this is impossible. It should be permitted, however, only to those in whom the disease has been quiescent for several years, and who have a good constitution and a good family history.

Improper Food and Hygiene. An increased susceptibility to tuberculosis is very easily acquired as the result of improper food, bad hygienic surroundings, and lack of air and sunlight. The remedy is obvious; its application often difficult. Everything which tends to provide the poor with proper food and everything which gives the children a greater supply of fresh air and sunlight is important, in that it tends to prevent the development of this acquired susceptibility. Every new park, every new playground, every improved tenement, every vacation in the summer aids in the fight against tuberculosis.

Diseases of the Mouth and Throat. Diseases of the mouth and throat, hypertrophy of the tonsils and adenoids, especially if accompanied by cervical adenitis, all open the door for the entrance of the tubercle bacillus and should, therefore, receive early and active treatment.

Measles, Pertussis, and Influenza. Bronchitis and measles, pertussis and influenza, if accompanied by bronchitis or throat affections, are often followed by tuberculosis. They do not, of course, cause tuberculosis, but either stir a latent tuberculosis into activity or

prepare the ground for it by the lesions and general enfeeblement which they produce. Measles and whooping-cough should, therefore, be avoided if possible and, if contracted, the children should be protected even more carefully than is usual against contagion, not only during the illness but also during convalescence. The public must be taught to appreciate the dangers of measles and whooping-cough; the diseases should be reported to the Boards of Health, and patients afflicted with them should be isolated.

In short, every child that is predisposed to tuberculosis should be given a regime which will tend to make its organism more resistant. It should have proper and sufficient food, air and sunlight, cold bathing, live in the country if possible, begin school late, and have its throat put in normal condition.

METHODS OF CONTAGION AND THE MEANS TO PREVENT IT. The bacilli of tuberculosis are contained in the milk of tuberculous animals, the excretions from various tuberculous foci, and the sputum of patients with pulmonary tuberculosis. Contagion, in the vast majority of cases, occurs through sputum. The organism may be infected, in order of frequency, through the mucous membrane of the cavities of the mouth and throat, the bronchial mucosa, the intestinal mucosa, the skin, and the genital organs. Infection through the skin and the genital organs is, however, extremely unusual.

Contagion by Milk. Tubercle bacilli have been found but once in the milk of a tuberculous woman. A tuberculous woman should not nurse her child, however, even if she is able to do so, both because it debilitates her and because the infant not only suffers on account of an insufficient or abnormal supply of milk, but runs the risk of direct infection through the secretions of the respiratory tract.

This is not the place to discuss the bacteriology of human and bovine tuberculosis. It is safe to conclude, however, that the tubercle bacilli of the bovine type can produce tuberculosis in man and that they can be transmitted in foods coming from tuberculous animals, especially in the milk of cows with mammary tuberculosis. The role played by infection from animals is undoubtedly insignificant in comparison with that from the consumptive man, but it is important enough so that it would be contrary to all wisdom to relax in any way the laws formulated or the precautions now taken against bovine tuberculosis. The sale of milk or milk products of tuberculous cows should be prohibited. The tuberculin test should be used to determine the presence or absence of tuberculosis. In all cases in which there is any question as to the purity of the milk supply, the milk should be pasteurized for twenty minutes at not less than 155° F. Milk being a good culture medium and carrier of the tubercle bacillus, no one with open tuberculosis should be allowed to handle it in any way.

Contagion by Sputum. This is the usual agent of contagion. It is dangerous when either moist or dry. It is more dangerous

indoors than out-of-doors, where, under favorable circumstances, the bacilli soon die. Tubercle bacilli are most numerous in the dust of the dwellings of the tuberculous and especially in the dust of the floors. Older infants and children may get the dust and dirt on their hands and put their hands in their mouths or on their food. Preisich and Schutz found tubercle bacilli in the dirt under the nails in 14 per cent. of sixty-six children between six months and two years coming to the out-patient department of the Stephanie Children's Hospital, showing the alarming possibilities of contagion in this way. Tubercle bacilli may also be carried in the fine liquid particles projected during cough, loud talking, and sneezing. The droplets may be thrown as far as a yard.

Contagion by other Tuberculous Excretions. These may carry the tubercle bacilli in the same way as the sputum and enter the body by the same portals. Direct contagion from sputum, projected droplets, kissing, and close contact is the most common method of infection in the first few months or year. When the infant begins to handle things and to get its hands dirty, indirect contagion also plays an important part.

Means to Prevent Contagion. It is comparatively easy to guard the child against contagion when there is no consumptive in the family. The child must take only pure or pasteurized milk. It must not be taken to visit consumptives or have them visit it. It must not be kissed. It must not be allowed to play where people are allowed to spit; better than this, all expectoration in public places should be prohibited. It must not go to live in a house vacated by a consumptive unless it has been thoroughly disinfected. Compulsory notification of tuberculosis will aid in accomplishing this.

It is, on the contrary, extremely difficult to guard the child against contagion when there is a consumptive in the family. This is especially true among the poorer classes where overcrowding, with the consequent increase in the opportunities for infection, is the rule, and where all or most of the causes which increase the child's susceptibility are active. The importance of family contagion is shown by the fact that Comby found parental tuberculosis in more than one-third of the cases in which he found tuberculosis at autopsy. The first principle in the treatment of these cases is to get the patient out of the house if possible. A tuberculous servant or nurse should be discharged. A parent or other member of the immediate family should leave if possible. The public should provide sanatoria or hospitals for such patients, if they are unable to take care of themselves. If, as is usually the case, the patient is obliged to stay at home, the children should, if possible, be sent away, preferably to the country. The protective influence of country life on the children of consumptives is shown by Dr. Mercier's results. Only three per cent. of the children of tuberculous parents sent to the country died, while 50 per cent. of their brothers

and sisters who remained at home, perished. The work of the Society for the Protection of Children against Tuberculosis recently organized by Grancher in France is along these lines. They take, however, only children between five and thirteen years of age, as they are less liable to the diseases of early infancy, are more resistant to infection, and can be of use to the family taking them. The cost per child is one franc per day.

When the patient or the children cannot be sent away the measures taken must vary according to the circumstances in the individual case. In order to avoid direct contagion the patient and the children should be kept apart as much as possible. They should not sleep in the same room and certainly never in the same bed. Kissing must be prohibited. The patient must not cough, talk loudly, or sneeze nearer than three feet from the children. In order to avoid indirect contagion, the sputum must be taken care of and destroyed according to modern methods. Nothing used by the patient should be used by the children. The children should be kept off of the floor and out-of-doors as much as possible. The rooms must be cleaned by wiping with a moist cloth and not by sweeping and dusting. They must be aired and sunned as much as possible. In short, all the precautions which are in general use for the destruction of the sputum and the avoidance of contagion must be carried out, even more carefully than when adults only are exposed.

The results which have been obtained in New York during recent years, in consequence of the removal of advanced cases of consumption in the tenements to hospitals and of the disinfection of their apartments after their death or removal, and by the education of consumptives and their families as to the nature of the disease and the proper disposal of the sputum, as shown by the diminution in the death-rate from pulmonary tuberculosis and tuberculous meningitis in children under fifteen years of age, are most encouraging. During the ten-year period ended in 1902 the death-rate from these diseases in children was more than 40 per cent. lower than during the previous ten years, the rate in 1892 being 5 per 10,000, and in 1902, 2.96 per 10,000. Dr. Biggs justly gives as his opinion, based on the results already obtained, that with an extension of the regulations now being enforced, a wider diffusion of information as to the nature of the disease, and larger facilities for the care of advanced cases, there will be a still further and a rapid reduction in the death-rate from tuberculosis in this early period of life, and that these data afford greater encouragement in the crusade for the prevention of tuberculosis than any others which are at our command.

To sum up, the separation of children from tuberculous adults is the most simple and rational method of protecting them against contagion. Such separation, however, is often impos-

sible. The only practicable method then is the observation in the best way possible in the individual case of the principles of hygiene and habitation. When a family is in reduced circumstances the public must step in and help them. What can be done as to the separation of the children from the patients and as to sanitation depends in each case on the circumstances of the family and the provisions for the care of the tuberculous made by the public. That is to say, protection against tuberculosis is largely a question of money.

TUBERCULOSIS AMONG THE NEGROES.¹

BY THOMAS JESSE JONES, PH.D.,

DIRECTOR OF THE RESEARCH DEPARTMENT OF THE HAMPTON NORMAL AND AGRICULTURAL
INSTITUTE, HAMPTON, VIRGINIA.

My first aim is to show the tremendous importance of the study and prevention of tuberculosis among the negroes of the United States. While it is well known that this disease is quite prevalent among negroes, few if any of us know the extent of this prevalence, and I fear that none of us realizes the serious effect of this prevalence upon the vitality of the nation and particularly upon that part which dwells in our cities.

The seriousness of the problem presented by consumption in any race depends upon three facts: (1) The extent of the disease within the race; (2) the proportion which the race forms of the total population; and (3) the proximity of the race to other races.

A glance at Chart 1, shows that the death-rate for the colored people is from two to seven times that of any other race, with the exception of the Irish, whose death-rate is about two-thirds that of the colored. As to the extent of consumption, this chart proves that the negro death-rate is far greater than that of any other people.

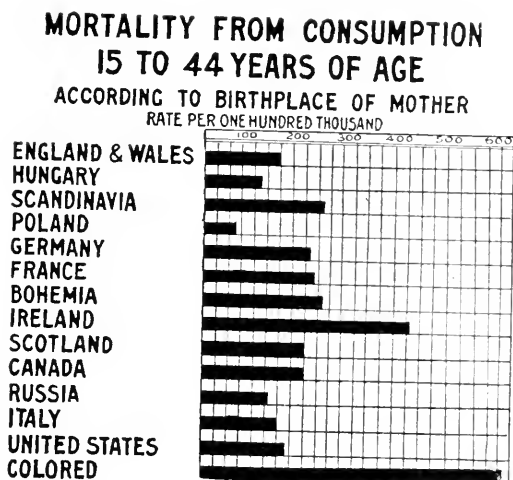
A comparison of the proportion which these foreign peoples form of the total population emphasizes the seriousness of the condition among the colored people. While the negro people are eight millions and a half, or 11 per cent. of our population, only five of the twelve nationalities here mentioned are over a million in number. The Germans number six millions and a half, but their death-rate is only one-third that of the colored. The English, the Canadians, and the Scandinavians are each a little less than two millions. With a death-rate of less than a third of that of the colored, their tuberculosis problem, together with that of the other nationalities noted on the chart, becomes almost insignificant. Only the

¹ Read at the meeting of the National Association for the Study and Prevention of Tuberculosis, Washington, D. C., May 17 and 18, 1906.

Irish offer a tuberculosis problem which is at all comparable with that of the colored race. But the proportion of the Irish is only one-half that of the negroes and the death-rate is only two-thirds. Combining these two items of death-rate and proportion, we can say that the danger to the nation of tuberculosis among the negroes is four times that among the people whose mothers were born in Germany, six times the danger among Canadians, fifteen times the danger among the Italians, and twenty times the danger among the Polish people in this country.

This danger is still further increased by the proximity of the colored race to the other races. We are deeply moved by the fact that the Indian race is succumbing so rapidly to this terrible disease, but the effect of this high death-rate upon the vitality of the nation

CHART I



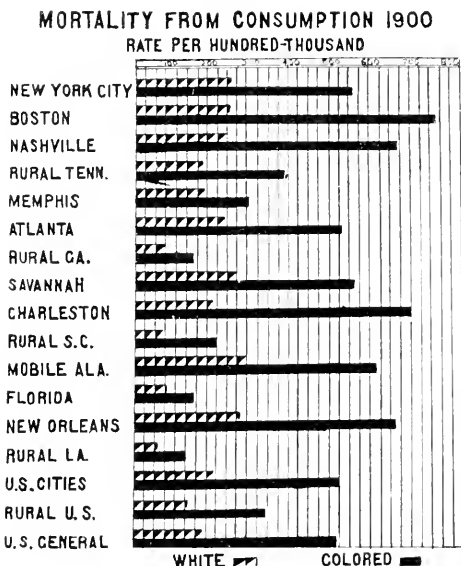
is very small, (1) because the Indian population is less than 1 per cent. of the people in the United States, and (2) because this small number is living apart from the other people of the country.

The extent of this proximity and the universality of a high consumption death-rate is indicated by Chart II. In the cities of the South, with a negro population ranging from 25 per cent. in New Orleans to 56 per cent. in Charleston, S. C., the death-rate of the negroes from tuberculosis is two and three times that of the whites. Though the proportion of negroes in Northern cities is small, the actual number is quite large. New York and Philadelphia, each with over sixty thousand negroes, have a very high death-rate from tuberculosis. Boston, with a negro population of about twelve thousand, has the highest rate of negro mortality from consumption of any city in the United States. According

to the census of 1900 for the District of Columbia the mortality of the 87,000 colored people from consumption was 448, while that for the 172,000 whites was 403. Thus a little over half of the total number of deaths is credited to a third of the people. If, as was stated in *Charities* for May 12, there is one consumptive to every one hundred Washingtonians it follows that there are one colored and one white consumptive to every two hundred Washingtonians.

This proximity is not merely that of the Italian laborer who works on the highways or in coal mines or on public buildings and dwells in a section of the city quite apart from others. The colored people of our cities are primarily engaged in domestic service. They are the cooks, the waiters, the porters; they wash the linen and clean houses; they enter the sleeping-room, the kitchen, and the dining-room;

CHART II



they are the nurses of the children, and in a hundred ways touch the innermost parts of many homes.

A study of Chart III increases the conviction that consumption among the colored people should receive most careful attention. The highest mortality for whites is from nervous diseases; the highest for colored is from consumption. Over one-fourth of all deaths among colored people are due to consumption and pneumonia.

In view of all these facts, namely, that the mortality from consumption is higher for negroes than for any other people, that the proportion of negroes in the United States is greater than that of any other special class, that the race is so closely related to other races

by its occupations, and that consumption is the most potent cause of mortality for that race—in view of all these facts, it would seem that this Association, engaged in the study and prevention of tuberculosis, should take some definite steps to study and prevent this disease among negroes.

CHART III

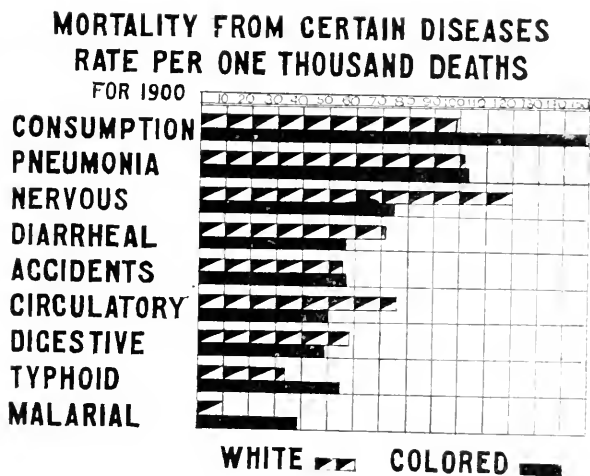
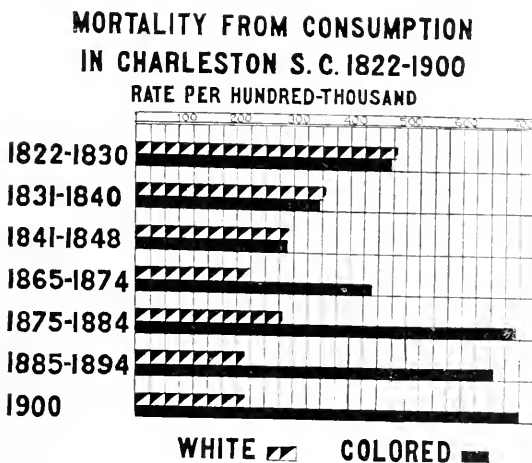


CHART IV



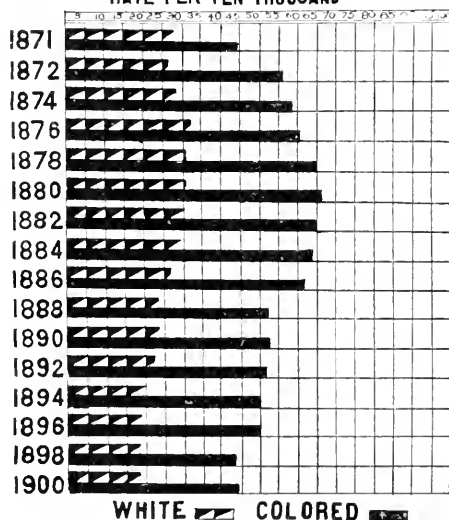
Having established the overwhelming seriousness of consumption among negroes in relation to the vitality of the nation, let me now state the more important facts pertaining to the causes and extent of the ravages of this disease upon the negro race both past and present. And here let me make due acknowledgment for my

facts to Miss Lillian Brandt, Mr. Frederick L. Hoffman, the Census of 1900, and the colored physicians who were kind enough to reply to my letters.

Chart IV, based upon facts obtained by Mr. Hoffman, supports the commonly accepted view that mortality from consumption among negroes was very much lower before the Civil war than it has been since that time. For the whites there has been a regular decrease from 1822 to the present time, with the one exception of the period 1875-1884. The mortality for the colored on the other hand, while slightly less than that of the white before the war increased at a tremendous rate between 1865 and 1884 until it became two and a half times as great as that for the whites.

CHART V.

**MORTALITY FROM CONSUMPTION
IN SOUTHERN CITIES 1871-1900**
RATE PER TEN-THOUSAND



The movement of the mortality rates are very well pictured by Chart V, also based upon facts arranged by Mr. Hoffman. It is interesting to note that the length of lives for white and colored vary proportionately. From 1871 to 1880 there was a gradual increase in the rates for both races. Since that time there has been a corresponding decrease, so that in 1900 the rate for the whites was slightly less than in 1871, and the rate for the colored had become the same as in 1871.

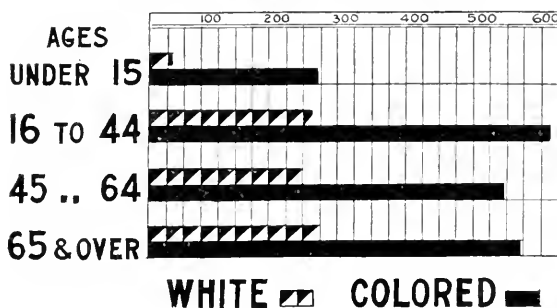
The most striking fact shown by Chart V is the high death-rate for colored children. While the rate for adults of the colored race is about twice that of the whites, the rate for colored children

under 15 years is over seven times that of the white children. The greatest mortality for colored is between the ages 16 to 44 years; that for the whites is at the age of 65 years and over. In this respect the colored race is similar to the Irish, the Italian, and the French.

I have deliberately avoided all discussion of causes in all that I have said in order to make clear the prevalence of the disease among the race and the seriousness of that fact in relation to the vitality of the nation. The discussion of the cause of the high death-rate is profitable only in so far as it assists us in our efforts to stamp out the disease. This is a self-evident statement, but one that should be emphasized for the reason that at this point friends usually become unreasonable and separate, the one class inclining to ascribe the prevalence entirely to racial characteristics and the

CHART VI

MORTALITY FROM CONSUMPTION IN REGISTRATION AREA 1900 RATE PER HUNDRED-THOUSAND



other class ascribing it altogether to environment. Let me quote from an article by one who attributes the mortality to inferior physique and lower vitality: "The higher mortality of the negro population from consumption and other tuberculous diseases," writes this well-known statistician, "is, unquestionably, primarily the result of race." In the very next paragraph he writes regarding the decrease for the decade 1890-1900: "As far as it is possible to judge, the decrease in the mortality from consumption has been largely the result of an improved environment affecting both races to practically the same extent." These two remarks seem to contradict one another. If race characteristics are primarily the cause, it would seem that improvement of environment would not affect both races alike. The extent to which the racial element enters into the cause of tuberculosis has not yet been determined. No individual or society has yet studied the case of the negro sufficiently

to say whether the racial element plays any part as a cause of this disease. The influence of environment is so tremendously in favor of tuberculosis among this people that it has been practically impossible to eliminate it sufficiently to discover the racial element. Few of us realize the great difficulties under which this race struggles. In our cities they live in the poorest houses. Even those who can pay for better homes are often compelled to occupy unsanitary dwellings. A third of the race is yet living in one-room cabins. The possible danger of such an existence is indicated by a fact which I discovered last year in a so-called two-room cabin: Two-thirds of the space in one room was filled by a stove and a table, one-half of the other room was filled by a bed. In this house thirteen children had been born since the war and twelve of the thirteen had died when they were children.

Almost one-half of the race is illiterate. The consequence of such a degree of ignorance upon the health of the race is far greater than we can realize. One ignorant father whom I know has infected his wife and nine children. Seven of these children cannot walk. The man is now dead, but the consumptive mother at the brink of the grave continues to wash for the white people of her city and her two sons work in barber shops. The unusual and heroic struggle for an education under adverse conditions is often a potent cause of consumption among colored students.

The economical disadvantages of the race develop an environment which contributes much to the increase of mortality from consumption. It is well known that the majority of tuberculous cases in all races are from the laboring and servant classes, and from that part whose weekly wage is ten dollars a week and under. This is true not only because the laboring and servant classes are numerous, but because the rate of mortality is higher for that class than for any other class of noticeable number. When it is remembered that over 80 per cent. of the negro race belongs to these classes, their economical disadvantages assume proportions which totally eclipse any racial predisposition.

It is not only in consumption that the race shows signs of its suffering. Its death-rate is high in almost all diseases, and the general death-rate is higher than that of the white in almost the same proportion as that for consumption.

What is the cause of the tremendous decrease in birth-rate for the last twenty years—a decrease two and three times as great as that for the whites? It is another evidence of unfavorable environment. It is the evidence of the suffering of a race struggling upward under difficulties. For practical purposes the racial predisposition is a negligible quantity. There is enough to keep us busy for some years to come in correcting the more apparent causes of consumption among the colored people without losing any time or energy in quarrelling over racial predisposition.

What is being done to change the situation?

I have searched diligently for any evidence of activity in behalf of the negro consumptive. The result of the search is very meagre for two reasons: (1) Because the States and cities and colored physicians with whom I have communicated have neglected to answer my request for information, and (2) because the efforts in behalf of the negro are "few and far between." The Charity Organization Society of New York City has an excellent committee at work on this subject. Washington has twenty-four beds in four shacks or tents located on the work-house grounds for people too poor to go elsewhere. I am glad to note that the local authorities are awake to the conditions and the necessity for relief and I hope that ample provision will be made for the colored as well as for the white. The Southern States are awaking to the need of sanatoria and legislative action for the prevention of this disease. Up to this time very little has been done even for the whites, and I cannot discover that anything has been done for the colored consumptive, aside from some free dispensaries and an out-door department in connection with the State Insane Asylum for Negroes at Petersburg, Va. The Medical Associations of several Southern States are beginning to create public opinion favorable to the erection of sanatoria, and in some instances special reference is made to the necessity of provisions for negro consumptives. Notable among these is the Virginia Association, with Dr. Paulus A. Irving, of Richmond, and Dr. Grandy, of Norfolk, as a special committee, which opens its report with the following significant recommendation: "We recommend the organization of Anti-tuberculosis Leagues throughout the State for the education of the people, not forgetting that the most important work is to be among negroes and the other working classes." Quite in line with this recommendation are the following words written by Dr. Oppenheimer, of Richmond, upon the sanitary conditions in that city: "If we wish honestly to reduce our death-rate, we must extend our city limits and give more attention and money to the care of the negroes." The Richmond *Times-Dispatch* commenting editorially on these words, wrote: "We talk much of our influence upon the black race; but we must never forget that the black race exerts a reflex influence upon us. If we do not help lift them up, they will help to pull us down." These sentiments must be encouraged. The 1700 colored physicians of the land must be enlisted in the cause. The negro conferences held annually at Atlanta, Hampton, Tuskegee, and other schools for negroes must be interested in the subject. The colored ministers must be informed of the ravages of the disease upon their people, and urged to speak to them about it. Southern States and cities must be aroused along the lines mentioned by Drs. Oppenheimer, Grandy, and Irving, of Virginia, so that they may provide hospital and sanatorium facilities open to negroes.

TUBERCULOSIS AMONG THE OGLALA SIOUX INDIANS.¹

BY JAMES R. WALKER, M.D.,

AGENCY PHYSICIAN, UNITED STATES INDIAN AGENCY, PINE RIDGE, SOUTH DAKOTA.

A PROPORTION of the population of South Dakota larger than that of any other State in the union, except California, Tennessee, and Kentucky, is tuberculous. This is not because the unavoidable conditions of South Dakota favor the development or progress of this disease, but because so large a proportion of the population consists of Indians who are affected with tuberculosis to a much greater extent than are the white residents.

The Pine Ridge Reservation is in South Dakota, and has the largest Indian population of any reservation in the State, and the second largest of any in the United States. This population is 6686, of whom 4870 are full-blood Oglala Sioux, and 1816 are mixed-bloods. The distinction between full-bloods and mixed-bloods is made, because the differences between these two classes of people are so great and so many that to consider them indiscriminately in social statistics of any kind would give erroneous conclusions in regard to both. For this reason the Indians referred to in this paper are only the full-blood Oglalas.

For ten years an effort has been made to keep trustworthy sanitary and vital statistics, and statistics of other social factors that might have an influence on the health of these Indians, and advantage has been taken of every opportunity to secure trustworthy information relative to these matters previous to the time when the statistics were begun. The data obtained in this manner form the basis of this paper. Tedious statistical details are avoided, and only conclusions believed to be justified by recorded facts are given.

Tuberculosis among these Indians does not differ in any respect from tuberculosis among white people. The infecting material is the same, and is produced and disseminated in the same way, individuals are infected in the same manner, and the disease runs the same course, produces the same results, and is subject to the same measures, remedial or preventive, as it is among the white people. It does not show any especial affinity for the Indian, nor affect him under any condition in which it would not affect a white man. There is no inherent peculiarity of the Indian which renders him more liable to infection with tuberculosis than is a white man under like circumstances.

The average length of the newborn Indian infant is 19.5 inches, and its average weight is 7.5 pounds, which is a little longer and heavier than is the average infant born of white parents in the

¹ Read at the meeting of the National Association for the Study and Prevention of Tuberculosis, Washington, D.C., May 17 and 18, 1906.

United States. It appears then that the Indian infant begins life with a little better physique than does the white infant. The growth of the Indian, through childhood and adolescence, as compared with that of the whites, is normal. They arrive at their full stature, the male at twenty-three, and the female at twenty-one years of age. The average height of the adult male Indian is 69.57 inches, and of the female 64.5 inches. This makes the average height of the male Indian 1.9 inches above that of the average male white of the United States; as I have no statistics relative to the height of the white women, no comparison of the heights of females is made.

The male Indian increases in weight until forty-five years of age, when the average weight is 161 pounds, which is six pounds heavier than the average weight of the white man. The female increases in weight until fifty years of age, when the average weight is 153 pounds.

The average measurement of the chest of the male Indian is 38.75, which is 0.25 of an inch less than that of the white man. The average of the female Indian is 36.5 inches. The average expansion of the chest of the male Indian is 3.25 and of the female 2.75 inches. These measurements indicate that the respiratory organs of the Indians are normal. The average strength, endurance, and vitality of these Indians appear to be about the same as that of the whites.

It thus appears that in person the Indians are as well adapted to fulfil the requirements of a healthy life as are the whites. Yet a much larger proportion of these Indians than of the white people are infected with tuberculosis. This must be the result of external conditions that do not especially pertain to the Indians.

To learn what these conditions are is of the greatest importance, not only to these Indians, but to mankind.

Tuberculosis existed among these Indians before they came into contact with the white people, but at that time the disease was rare among them, and remained so until they changed their nomadic to a settled life in houses. When they began to live in houses, tuberculosis began to increase among them, so that the conditions which caused this increase must have been different from those surrounding them when they lived in tepees.

They were filthy both when they lived in tepees and when they lived in houses. It was statistically demonstrated that those who were the most cleanly were less susceptible to infection by any disease than were the most filthy, and, conversely, that the most filthy were the most susceptible to infection of every kind; but there is no evidence that this filth ever caused tuberculosis, except when it was mingled with the specific germs of the disease.

In their primitive life the principal food of these Indians was flesh. Sometimes they had this in an abundance, and sometimes they had little. In times of plenty they would surfeit upon raw

or poorly cooked meat, and in times of scarcity they would go hungry. They had no meal times, but ate when inclined or opportunity offered. Notwithstanding this unsanitary way of eating, they were comparatively free from tuberculosis.

When they began to live in houses the Government supplied them with an abundance of food, and in a much greater variety than they had been accustomed to. It also supplied them with cooking stoves and utensils, so that their food was better cooked than it was when they lived in tepees. Coincident with this increase of food, prepared and taken in a more sanitary way, was the increase of tuberculosis among them.

But it was demonstrated that those who prepared their food the best and in the most cleanly manner, and took it in moderation and at regular intervals, were freer from infection of every kind, including tuberculosis, than were those who glutted themselves upon food filthily prepared and insufficiently cooked. But the question of food was only the question of fortifying the system more or less securely against infection, for there is no evidence that food of any kind, including tuberculous beef, ever caused tuberculosis in any Indian.

During their savage life the clothing of these Indians was of skins fashioned after a primitive style, the same for every season of the year, except that the robe was added in the winter time. They never laundered them or changed them for purposes of cleanliness. At this time they were often subjected to inclement weather with insufficient clothing, and often slept with insufficient covering to keep them warm. They often were exposed to great hardships and to exhausting physical exertion. But the evils of poor clothing, hardship, and exposure were offset by the invigorating effects of their out-door life, and they were less vulnerable to infection of every nature than they were afterward.

When they began their settled life in their houses they were provided with better clothing in sufficient quantity, and they were supplied with blankets and bedding sufficient to keep them comfortable at night. The reasons for their exposures and hardships were removed, and they led a much quieter and easier life. But with these improved conditions there was an increase of tuberculosis among them. The benefits of their better clothing and their relief from hardship and exposure were offset by the debilitating effects of the sedentary life they began to live.

Their tepees were so constructed that they were amply ventilated at all times. They were moved often, and each time were thoroughly freed from dust, and renovated before being set up. When living in them they threw their slops about the door, but moved before these began to putrefy. In the tepee the handiest place to spit is in the open fire in the centre, and the Indians habitually spat there. The sanitary condition of these tepees, thus, was good

at all times. They were too small to permit of many crowding into them, and were moved so often that neighborly relations were constantly changing. Such a life in such habitations would tend to promote a vigorous constitution, and to fortify the system against infection of every kind, and it would tend to prevent the accumulation of infecting material, or the subjection of many persons to it.

When these Indians were gathered on a reservation the governing policy was to get them settled in fixed homes, and they were urged to build houses. But no plan for building or instruction as to the sanitary requirements of a house was supplied them. They built their houses small and low, with tight dirt roof and the ground for a floor, with every crack or crevice stopped with daubing for the purpose of preventing ventilation.

A heating and a cooking stove were provided for each house. In cool weather these were both fired at once, and the Indians would crowd into these superheated cabins and swelter there. If the door of such a place were opened on a cold day the exhalations of the inmates would condense in a cloud that was stifling to one unaccustomed to such air. Such conditions of life were debilitating, and lowered the resistance to morbid agencies of every kind. They threw their slops about the door as they did when living in tepees, but they could not move away from them, and their surroundings soon became noisome with filth. They would make prolonged visits, two or more families crowding into rooms not large enough for one, and thus pollute the air and the surroundings at double the rate.

These Indians began the use of intoxicating drinks before they began to live in houses, and before tuberculosis began to increase among them. There is no evidence that this ever caused tuberculosis among them, but it was demonstrated that it did produce a condition that was favorable to infection with tuberculosis and hastened its development and increased its virulence.

None of the conditions that have been mentioned, nor any other that was investigated, were sufficient to account for the increase of tuberculosis among these Indians at this time, except when taken in connection with the presence of the specific infecting material of the disease.

From time immemorial there were a few cases of tuberculosis among these Indians. When they lived in tepees the conditions of their lives were such that the infecting material was reduced to the minimum, their resistance to infection was raised to the maximum, and the opportunities for infection were few. Consequently the number of cases were few. But when they lived in houses these conditions were reversed.

The conditions of life aggravated the disease in the tuberculous sick, increasing the infecting material. They debilitated all and increased their susceptibility to infection, and crowded them together

in the presence of the infecting material. In fact, all the requisites for the propagation and spread of the disease were supplied.

Where statistics were obtainable they showed that every new tuberculous subject had been exposed to contact with the waste products of the disease before he showed infection, clearly establishing the fact that each was infected by this means. It is reasonable to assume that every tuberculous subject among these Indians became infected in this way. This accounts for the increase of tuberculosis among them, and no other theory does so.

Thus the reason for the preponderance of tuberculosis among these Indians becomes as simple as would be the reason for the preponderance of smallpox among them if they should expose themselves to infection by that disease. Just as smallpox can be prevented among them by preventing their coming in contact with its specific infecting material, so can tuberculosis be prevented, as has been demonstrated by the following experiment:

In 1896 it was asserted that more than one-half of the Oglalas were tuberculous, and that more than 75 per cent. of the total number of deaths among them was caused by this disease. This was an exaggeration that is common in discussing tuberculosis among Indians.

The facts were that there were at that time 4983 Oglalas, of whom 741 were tuberculous; of these 124 died that year. That is 148.7 per 1000 were tuberculous, and the annual death-rate from this disease was 24.88 per 1000. As the entire annual death-rate was 52.88 per 1000, the deaths from tuberculosis was but 47 per cent. of this. But this death-rate was appalling, since the annual birth-rate was but 41.34 per 1000, which showed a decrease of 11.64 per 1000, the excess of the death-rate over the birth-rate.

At this time the control of tuberculosis among these Indians was undertaken. The following premises were assumed: Tuberculosis is an infectious disease caused by a specific material. This material is mingled with the products of the disease, and is not produced naturally otherwise. When discharged from the body with these products of the disease, this material may be collected and destroyed. If this infecting material is prevented from coming in contact with the uninfected, tuberculosis will be prevented.

The plan was to impress these Indians with an effective understanding that tuberculosis is always caused by the infectious material coming from one who has the disease, and that this infecting material is contained in the sputum of consumptives and the discharges from scrofulous sores.

Attempts were made to induce the Indians to use every means to prevent the uninfected from contact with infectious material; to get the infected Indians out of their houses and into their tepees again, or into tents, and keep them in the free air and sunshine as much as possible; to prevent their mingling with the uninfected

as much as possible; and to collect carefully the products of the disease, and destroy them before they could come into contact with others.

It was not expected that this plan could be brought into effect at once, but it was intended to develop it as fast as circumstances would permit. At first the authorities gave hearty support to the work, and the co-operation of the Indians was secured beyond expectation, so that the work was made effective according to the plan much more rapidly than had been foreseen.

Tuberculosis was steadily and continuously reduced among these Indians for five years from the time the work was begun, when the proportion of tuberculosis was found to be reduced from 148.7 to 105.4 per 1000, and the annual number of deaths from this disease from 24.88 to 13.45 per 1000; that is, tuberculosis was reduced nearly one third, and the death-rate from it nearly one half.

There would, doubtless, have been a greater reduction had the Indians been so situated that better supervision could have been given them, but they were scattered over a territory as large as the state of Connecticut, and it was impossible for one physician to give to all the personal supervision necessary to keep them from lapsing from the sanitary work required of them to produce the best results.

After five years of this work the physician who had charge of it was deprived of the opportunity of giving it his personal supervision, and the Indians became neglectful of sanitary conditions, whereupon, tuberculosis began again to increase among them. When they observed this they lost confidence in the efficiency of their work, and because there was no one whom they considered authority on the disease to supervise them, it became intermittent and ineffectual. Thus, the disease has increased and now the proportion of tuberculous among them is 120.64 per 1000.

As the conditions of these Indians, except those effected by the effort to control the disease among them, have remained the same, before, during, and since this effort was made, the soundness of the premises assumed before beginning it, and also, the fact that tuberculosis can be suppressed among them, are proved.

In view of these facts the following proposition is submitted:

A practical method for suppressing tuberculosis among these Indians would be by the establishment of a sanitary camp, where all that are infected with the disease should be collected and maintained, under competent supervision, until each case terminates.

ORGANIC HEART DISEASES AND IMMUNITY FROM PULMONARY TUBERCULOSIS.¹

BY BOND STOW, A.M., M.D.,

PATHOLOGIST TO THE METROPOLITAN HOSPITAL, NEW YORK CITY.

WHETHER organic heart diseases do or do not grant immunity from pulmonary tuberculosis depends upon the presence or absence of a coexisting long-standing passive hyperemia in the pulmonary circulation. This is the central thought of my topic, for it is just as demonstrable that the organic heart lesions accompanied by an anemia in the lungs, in the large majority of cases, are followed by pulmonary tuberculosis, as that those that produce a passive hyperemia either prevent its occurrence, or, if it has previously existed, retard its advancement or effect its extinction.

Before entering more in detail upon the topic of the paper, I desire briefly to call attention to a few well-known anatomical facts which intimately concern the subject in hand. The heart, having its right ventricle forcing the blood into the lungs, on the one side of the lesser circulation, and the left ventricle receiving its aerated blood on the other, because of this peculiar position of regulating the pulmonary blood supply, seems more intimately associated in a causal relation to certain diseases of the lungs (among them being tuberculosis) than any other organ. Again, the pulmonary circulation is peculiarly affected by the heart's action in that its arteries receive the direct full impact of each ventricular stroke, since there is no intervention of a long system of blood-vessels between them and the heart. Again, I would call attention to the fact that the pulmonary arteries, even to their finer branches, since they have walls much thinner than corresponding vessels in the systemic circulation, due to their poorly developed muscular coat, cannot accommodate themselves readily to variations in the blood-pressure, and hence are readily subject to passive stasis.

From the foregoing it is plain that even slight disturbances in the heart's action must exert a direct influence upon the pulmonary circulation. How readily then can it be understood that long-standing circulatory disturbances must leave their indelible stamp upon the pulmonary tissues.

Such disturbances arise chiefly from a deranged valvular mechanism of the heart (causing either stenosis or insufficiency or both) which eventually leads to one of two conditions in the lungs, an increased or a diminished blood supply.

A free entrance of blood into the pulmonary arteries with a retarded exit from the pulmonary veins through the left auricle, as

¹ Read before the Section on Medicine of the Academy of Medicine, New York City, March 20, 1906.

occurs in a well-marked case of mitral stenosis, must lead to pulmonary stasis, a condition quite the reverse to that in which there is a hindrance to the passage of blood into the pulmonary arteries, as in a well-marked case of pulmonary stenosis.

These two conditions thus are diametrically opposed to each other and statistics readily prove that the one just as surely grants immunity from tuberculosis as that the other predisposes to it. Therefore, in any discussion of whether organic heart diseases do or do not grant immunity from tuberculosis, diseases of the two sides of the heart must be kept distinctly separated. The question of immunity seems to resolve itself into the amount of blood within the pulmonary tissues; and if at this point I were to enter upon that fascinating study of the bactericidal properties of the blood, I fear I should be carried far beyond the scope and object of this short paper. For whether we adopt the theory of immunity as promulgated by Metchnikoff and based upon the phagocytic power of the microphages and macrophages, or Ehrlich's side-chain theory, based upon the chemical affinities of the blood, or better still the more probable one that combines both these theories, is at present immaterial.

The object of this paper is to show that those organic heart lesions accompanied by well-marked pulmonary stasis, thus concentrating in the lungs the immunizing agents of the blood, whatever they may be, are rarely followed by phthisis pulmonalis, or if this previously existed, they exert a salutary effect upon it, and that the reverse conditions frequently are followed by pulmonary tuberculosis.

Louis¹ was among the first to draw attention to the fact that stenosis of the conus arteriosus or the pulmonary orifice is occasionally followed by tuberculosis of the lungs. Stoelker,² in 1864, gathered from the literature 116 such cases, of which 16 (14 per cent.) had tuberculosis. Lebert,³ in 1867, stated that fully one-third of such cases become complicated with tuberculosis. Bernard Schulze,⁴ in 1891, gathered accurate statistics on the subject, and asserted that 83.3 per cent. of such cases are followed by tuberculosis of the lungs. Thus, as we approach the present time, when autopsies are accurately performed and data carefully recorded there seems little doubt that pulmonary stenosis, with its consequent pulmonary anemia, is followed, in the large majority of cases, by pulmonary tuberculosis. As is well known pulmonary stenosis is almost always congenital; as a condition secondary to pulmonary tuberculosis it has never been recorded and very likely does not occur.

¹ *Memoires ou recherches anatomico-pathologiques sur la Phthise*, Paris, 1826.

² *Ueber angeborene Stenose der Arteria Pulmonalis*, Berlin, 1864.

³ *Einfluss der Stenose des Conus Arteriosus, u. s. w. auf Entstehung der Tuberculose*, Berl. med. Woch., 1867.

⁴ *Beitrag zur Statistik der Tuberculose verbunden mit Herzklappenerkrankungen*, Inaugural Dissertation, Kiel, 1891.

As regards the left side of the heart, Rokitansky¹ was the first to draw attention to the fact that disorders of the heart leading to pulmonary stasis are rarely associated with tuberculosis, saying: "Cyanosis or rather every disease of the heart, vessels, and lungs that causes cyanosis is incompatible with tubercle formation; that is, it offers an extraordinary immunity from tuberculosis." This statement has been the subject of much discussion and no little opposition, but in the main its truth holds as good today as when it was first promulgated. In general it has been supported by Traube,² Peter,³ Fraentzel,⁴ Kryger,⁵ Eichhorst,⁶ Otto,⁷ Bamberget,⁸ Eymann,⁹ and others, although there have been minor differences of opinion. Frommolt,¹⁰ in 1875, stated that the co-existence of chronic valvular disease of the heart and pulmonary tuberculosis is by no means as rare as was formerly supposed; but inasmuch as in many of his cases secondary changes, such as hypertrophy and dilatation of the heart (especially of the right ventricle), were not marked, there was little reason to expect the development of the circulatory changes in the lungs (cyanosis) that give rise to the immunity from tuberculosis. Kryger, apropos of cases in which healed pulmonary tuberculosis is associated with valvular disease of the heart, states his belief that most frequently the restraint and healing of the tuberculosis is dependent upon the heart disease.

There remains still to discuss the differences in the incidence of pulmonary tuberculosis in cases of aortic and of mitral valvular disease. Frommolt, somewhat at variance with Traube, states that "diseases of the aortic valve complicated with pulmonary tuberculosis occur somewhat more frequently than those of the mitral valve; still the difference is insignificant." His statistics are: Total number of autopsies, 7870; cases of mitral stenosis, 76; combined with tuberculosis of the lungs, 4 (5 per cent.); cases of mitral insufficiency, 76; combined with tuberculosis of the lungs, 8 (10 per cent.); total for all mitral lesions, 15 per cent. Cases of aortic stenosis, 33; combined with tuberculosis of the lungs, 2 (6 per cent.); cases of aortic insufficiency, 52; combined with tuberculosis

¹ Oesterreichischer Jahrbücher, 1836, vol. xvii.

² Gesammelte Beiträge zur Pathologie und Physiologie, 1871, vol. ii.

³ Gazette des Hôpitaux, 1876.

⁴ Krankheiten des Herzens, 1899, vol. ii.

⁵ Ueber das gleichzeitige Vorkommen von Lungentuberculose und Klappenfehlern des linken Herzens, Inaugural Dissertation, München, 1889.

⁶ Handbuch der speciellen Pathologie und Therapie, 1889, Band i.

⁷ Das Ausschlussungsverhältnis zwischen Herzklappenfehlern und Lungenschwindsucht, Virchow's Archiv., vol. cxli.

⁸ Lehrbuch der Krankheiten des Herzens, 1857.

⁹ Ueber die Combination von Phthise und Herzfehler, Inaugural Dissertation, Würzburg, 1886.

¹⁰ Ueber das gleichzeitige Vorkommen von Herzklappenfehlern und Lungenschwindsucht, Archiv der Heilkunde, 1875, vol. xvi.

of the lungs, 7 (13.5 per cent.); total for all aortic lesions, 19.5 per cent. Traube would lead one to believe that aortic insufficiency is not infrequently followed by tuberculosis of the lungs, since he states that he has seen a number of such cases. Traube's statement, based upon a large clinical experience, must receive due consideration. The discrepancy between his and Frommolt's statement may be accounted for in two ways:

1. Frommolt's conclusion is based upon actual postmortem findings, whereas Traube's is largely upon clinical observation, and the fact must not be overlooked that even the best of diagnosticians have been misled in such cases as we are now considering, by accidental murmurs and falsely enlarged boundaries of the heart, owing to tuberculous consolidation of the on-lying borders of the lungs. Recently, I was called upon to decide the presence or absence of an organic heart lesion in a case of advanced phthisis pulmonalis. Auscultation showed a very loud, coarse, rasping, systolic murmur, localized at the apex. (Its timbre was that of an organic and not an accidental murmur.) The boundaries of the heart could not be outlined owing to consolidation of the on-lying borders of the lungs. The second pulmonic sound was accentuated. A diagnosis of organic heart lesion of the mitral valve had been made. I did not coincide with this diagnosis on the grounds: first, that the association of organic disease of the heart and advanced tuberculosis is very uncommon; second, that the heart boundaries could not be outlined; third, that the murmur remained localized, not being transmitted in any direction. Later, the autopsy proved a normal endocardium throughout and the mitral valve smooth and thin. There was advanced fatty degeneration of the heart muscle and a *relative mitral insufficiency* in consequence. I speak of this case as one of many in which the clinical diagnosis of organic heart disease of the endocardium in cases of advanced phthisis pulmonalis is not substantiated at the autopsy, and offer it as a warning against forming too hasty conclusions from the findings of the too oft misleading stethoscope.

2. Frommolt himself admits that in many of the cases from which he drew his conclusions, the "*sine qua non*," namely, well-marked secondary changes of hypertrophy and dilatation were absent. How decidedly necessary these are, at least in cases of mitral stenosis, Traube emphasizes.

However, Traube's statement that he never saw a case of tuberculosis following a mitral stenosis with well-marked hypertrophy of the right ventricle must remain an individual experience, for in this extreme none of the authorities seem to concur.

Bernhard Schulze's statistics are: Total number of autopsies, 6535; mitral lesions, 42; combined with tuberculosis, 2 (4.76 per cent.); aortic lesions, 52; combined with tuberculosis, 8 (15.4 per cent.).

In concluding the subject I offer the following summary:

1. Organic valvular diseases of the right side of the heart that produce pulmonary anemia afford conditions favorable for the ready growth of the tubercle bacillus and are as a fact most frequently associated with pulmonary tuberculosis.

2. Organic valvular diseases of the left side of the heart when accompanied by well-marked secondary changes of hypertrophy and dilatation, producing long-standing passive hyperemia of the lungs, are very rarely followed by tuberculosis of the lungs and not infrequently effect an extinction of a previously existing tuberculosis.

3. The exceptional cases that do arise must be accounted for by certain qualitative and quantitative changes in the bactericidal properties of the blood, reducing its immunizing powers.

And now, a practical point in the treatment of at least incipient phthisis suggests itself.

Nature clearly points the way in two instances: chronic emphysema and those valvular heart lesions that produce long-standing pulmonary congestion. In both these instances the autopsy frequently has revealed quite extensive tuberculous processes that have become entirely extinct. On the other hand, all pathologists and clinicians of much experience agree that tuberculosis rarely follows these two conditions.

What is the chief underlying pathological condition produced by these two affections? A constant passive congestion of the lungs.

What does this mean from the standpoint of immunity or therapeutics? That there must be collected in the lungs and kept there constantly an increase of those agents of the blood that are antagonistic to the growth of bacterial life.

When we have the reverse conditions, nature's struggles against the white man's scourge are indeed too sad to relate; frequently the autopsy reveals in persons in the prime of life afflicted with chlorosis or general anemia, primary or secondary, lungs that have become completely destroyed by tuberculosis within a few weeks.

All this suggests in the treatment of our cases of at least incipient pulmonary tuberculosis physical exercise in the open air, several times a day, sufficient to produce severe congestion of the lungs; not mere gentle walking or driving, but running until the induced congestion of the lesser circulation interferes with the free action of the right ventricle and forces temporary rest. There never was a truer remark, made half in jest, than that of Elbert Hubbard's, in his little monthly pamphlet, *The Philistine*, "Tuberculosis is but a form of laziness."

Naturally, one must be governed in each individual case as to the character and amount of physical exercise prescribed. It is quite outside the scope of this paper to attempt to formulate rules of treatment or to exercise for others that judgment so requisite in the successful treatment of any disease.

I have been attempting to point out the conditions under which the autopsy discloses that nature frequently does effect a cure of phthisis pulmonalis even though this may have gained a very extensive foothold, as evidenced by Case I, herewith reported. To this frequent daily exercise must be added climatic conditions high in oxygen content, and therefore relatively free from germ life, together with plenty of such food as experience teaches will best build up and fortify nature's defences against microbial life—namely, the bactericidal properties of its blood.

I have intentionally spoken of incipient phthisis, being fully aware that the dangers of a sudden hemoptysis arising in the cases of advanced phthisis from the artificially produced local increased blood pressure caused by the severe physical exercise is a risk that few therapists would care to assume. Even in the case of incipient phthisis there is some risk that must be assumed in this respect, and it would be well to explain this to one's patient before beginning the treatment herein suggested.

The following two cases illustrate typically the effect organic heart disease has upon the tuberculous processes of the lung, thus fittingly supporting the opinions expressed in this paper:

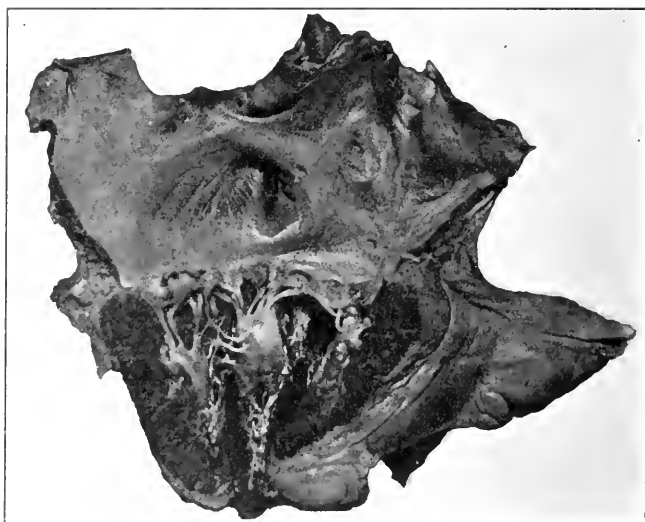
CASE I.—Metropolitan Hospital, New York City, November 11, 1905. M. B., aged forty-seven years, widow; occupation, general housework. Family and personal history are negative. Present illness began about six weeks ago, with a loose cough accompanied by sharp pains over anterior aspect of chest and a profuse whitish serous expectoration. No hemoptysis, no night sweats, no noticeable loss of weight. Subcutaneous and muscular tissues well-nourished. Extremities cold, cyanotic, and oedematous. Pupillary reflex is normal. Chest well-developed and symmetrical. Respiration regular, deep, and easy. Expansion good. Lower right lobe gave flat percussion note and auscultation revealed bronchial respiration. Harsh bronchial respiratory sounds over upper lobe of left lung. Sibilant rales in the right axilla.

Apex-beat not visible. Palpation showed it to occupy one finger's breadth in left midsternal line. At the apex were heard a presystolic and a systolic murmur transmitted to the left and a sharp accentuation of the second pulmonic sound. Pulse was regular, moderately full, and tense. Superficial arteries sclerosed. Sputum analysis on three different occasions showed absence of tubercle bacilli.

Autopsy, January 11, 1906. Postmortem rigor present. Hypostatic congestion in dependent parts of the body. Cyanosis of face, finger tips, and toes. Pupils each equally dilated about 4 mm. Slight oedema over both ankles and tibias. Petechial hemorrhages over anterior surfaces of both legs. Subcutaneous and muscular tissues well preserved. Abdomen prominent and fluctuates under palpation. Abdominal cavity contains fully 4000 c.c. of a clear

light amber colored transudate in which appears no flocculent masses. Peritoneum is smooth, glistening, and transparent. Right pleural cavity contains about 500 c.c. of a light amber colored, partially turbid fluid, in which are floating flocculent recently formed fibrinous masses. Right pleura, over lower lobe of lung, has recently formed fibrinous masses attached to it and at the apex of the right lung are old tough pleuritic adhesions. Left pleural cavity contains very small amount of clear light-amber colored fluid containing no fibrinous flocculi. At the apex of the left lung are old tough fibrous pleuritic adhesions. Pericardium not adherent to either lung. Pericardial sac contains about 200 c.c. of a clear, light amber-colored transudate contain-

FIG. 1

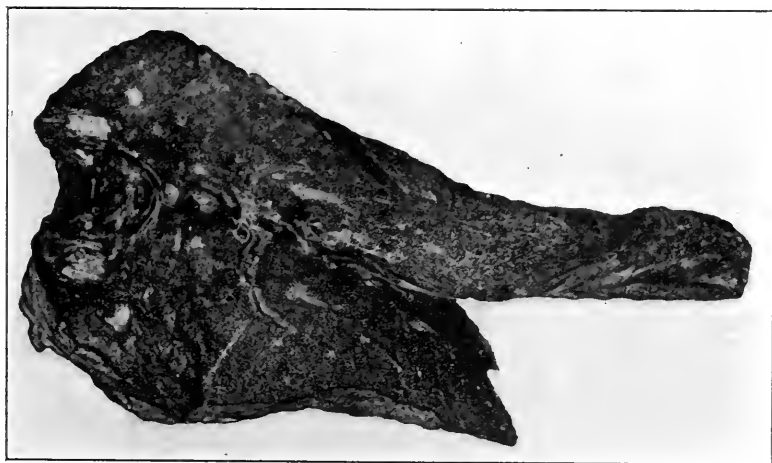


Stenosis of the mitral orifice with newly formed vegetations upon an old thickened valve. The vegetations were provoked by pneumococci from a coexisting lobar pneumonia of the right lower lobe.

ing fibrinous flocculi. Pericardium (both layers) is smooth, glistening, and transparent. Veins of external surface of the heart are engorged. Coronary arteries show arteriosclerosis. Both ventricles are dilated. Heart weighs 285 grams. Firm in consistency. Heart muscle of rich, brown color. Left ventricular wall measures 1 cm. at its apex and 0.3 cm. at its base. Right ventricular wall measures 3 to 5 mm.; right ventricle is dilated. Left auricle is dilated. Endocardium throughout is smooth, glistening, and transparent. Tricuspid and pulmonary valves show no change. Aortic valve shows beginning atheromatous changes at its base and at the

opening of the coronary arteries. Its closing margin is thin and free of growths. The valve is perfectly competent. The mitral valve considerably thickened along its closing margins, which is covered by recently formed vegetative growths and a few ulcerations (Fig. 1). The chordæ tendineæ are shortened and considerably thickened. The valve appears to be more stenotic than insufficient. Tissues of the pharynx and larynx show chronic congestion. Blood-vessels of œsophagus are dilated and engorged. Lungs: left upper lobe, at the apex, are several contractions from scar tissue and several extinct partially calcified tuberculous foci (Fig. 2), each well-defined from the surrounding normal tissue by a limiting wall of tough fibrous tissue. Balance of the lobe shows nothing abnormal. Lower lobe anteriorly and laterally near its upper margin also shows

FIG. 2

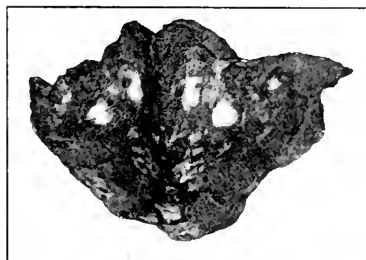


Apex of the left lung (Case I) showing healed tuberculous foci.

a few extinct tuberculous foci in every respect similar to those of the upper lobe. Balance of the lobe shows passive hyperemia and œdema. Nowhere in either lobe can any active tuberculosis be discovered. Right upper lobe at apices presents same appearances as corresponding left upper lobe (Fig. 3). One-half of the middle lobe is considerably contracted and contains tough, fibrinous connective tissue with numerous extinct calcified sharply circumscribed tuberculous foci (Fig. 4). The balance of this lobe is solid, finely granular, of dark-reddish color, evidencing red hepatization of acute lobar pneumonia. Lower lobe reveals the usual signs of red hepatization of acute lobar pneumonia. Nowhere throughout this lung can any active tuberculous process be discovered. The spleen, kidneys, and liver reveal the usual signs of cyanotic induration.

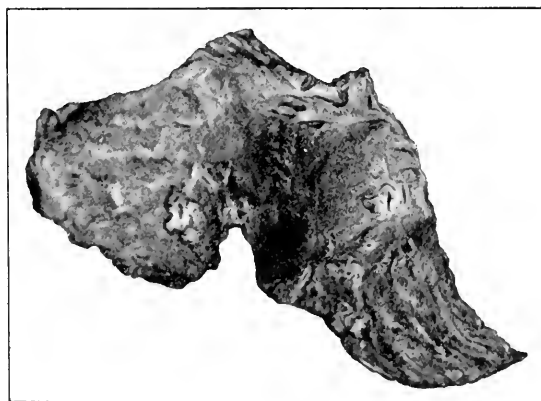
An acute splenic tumor is present. Stomach and intestines show chronic inflammation and passive congestion. Adrenals are normal. Microscopic examination of the portion of the lung affected by the pneumonia, as well as of the newly formed vegetative growths on the mitral valve, demonstrated a diplococcus similar to the Fraenkel-Weichselbaum diplococcus.

FIG. 3



Apex of the right lung (Case I) showing healed tuberculous foci.

FIG. 4



Middle lobe of the right lung (Case I) showing healed tuberculous foci and fibrosis. The dark portion in the centre is acute lobar pneumonia (which also involved the entire lower lobe of the right lung).

Diagnosis. Acute malignant ulcerative endocarditis of the mitral valve upon an old chronic inflammatory thickening; mitral stenosis with insufficiency; extinct tuberculosis of both lungs; acute lobar pneumonia of the right lower lobe and one-half of the right middle lobe; chronic cyanotic induration of liver, spleen, and kidneys; acute splenic tumor.

CASE II.—Metropolitan Hospital, New York City, December 18, 1905. W. S., aged fifty-one years, Ireland, salesman. Family

history negative. In childhood had measles, scarlet fever, and whooping-cough. When twenty-one had gonorrhœa. Five years ago had acute inflammatory rheumatism. On October 20, 1905, as result of exposure had severe pains in chest, with cough, fever, and night sweats. Recovered from this attack and upon a second exposure suffered a relapse with same symptoms. Bowels regular, appetite poor, sleep broken. Edema of both legs. All reflexes normal. Chest well-developed and symmetrical. Respiratory movements easy, regular, twenty-four per minute. Percussion and auscultation of chest negative, except a few crepitant rales at the bases of both lungs. Apex-beat: point of maximum impulse at sixth interspace left midsternal line. Right border of the heart at right sternal line. Left border reached 1 cm. to left of the midsternal line. A loud systolic blowing murmur heard at apex and transmitted to the left axilla. At the second right intercostal space close to the sternum could be heard a loud rasping systolic murmur transmitted upward into the carotids. The second pulmonic sound was loudly accentuated. Pulse regular, 90 per minute, hard and non-compressible. Lower border of the liver one finger's breadth below the margin of the ribs.

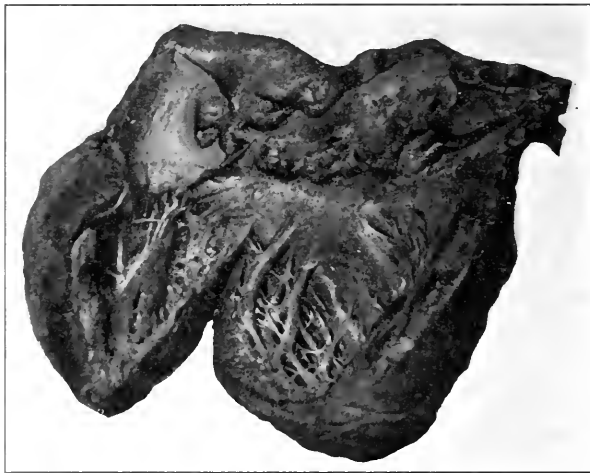
On February 11, 1906, patient had an attack of erysipelas of the face which increased in severity, bringing on delirium and causing death on February 13, 1906. Repeated examination of the sputum failed to detect any tubercle bacilli.

Autopsy. February 14, 1906. Body pale. Slight cyanosis of finger tips. Postmortem rigor present. Hypostatic congestion in the independent portions of the body. Pupils both equally dilated, 6 mm. Face deeply congested and cyanotic, especially about eyes and cheeks. Abdomen prominent and fluctuates on palpation. It contains about 2000 c.c. of a pale, light amber colored transudate. Peritoneum everywhere smooth, glistening, and transparent. Mesentery and mesentery glands normal. Diaphragm on right side at upper border of the fifth rib, and on the left side at the sixth rib. Each pleural cavity contains about 500 c.c. of a pale, light amber colored transudate. Pericardial sac about 30 c.c. of fluid. Pericardium is smooth, glistening, and transparent. Both ventricles of the heart are widely dilated. The veins on the external surface of the heart are engorged. Coronary arteries are slightly arteriosclerotic. The blood in both ventricles is fluid. Heart weighs 450 grams, soft in consistency, and of a light yellowish-brown color. The left ventricle widely dilated. Its wall measures at apex 1.5 cm. and at its base 2 cm. Right ventricle widely dilated. Its wall measures at apex 3 mm. and at its base 5 mm. The tricuspid and pulmonary valves are normal. The three cusps of the aortic valve are chronically thickened at their bases and their free margins are covered with numerous very large vegetative growths, some measuring 1 cm. in length. These growths very much narrow the

opening of this valve (Fig. 5). The posterior wall of the aorta above the left cusp shows recently formed vegetative growths due to an aortitis. The mitral valve admits the tips of four fingers. Its edges are smooth and thin (relative insufficiency). The left auricle measures from 1 to 4 mm. in thickness. The right from 1 to 2 mm.

Lungs. The apex of the left lung shows well-circumscribed extinct calcified tuberculous foci and considerable fibrous connective tissue. Balance of this lung shows intense congestion and œdema. The right lung shows the same appearances as the left. The liver, spleen, and kidneys show chronic cyanotic induration. There is a very extensive anemic infarct of the spleen which measures

FIG. 5



Aortic stenosis with extensive vegetations along the free margins of the valve leaflets. The left ventricle being laid open, shows the extensive dilatation; there was also fatty degeneration of the myocardium. The apices of both lungs showed healed tuberculous foci.

2.5 cm. in diameter on the surface of the spleen, and is 3 cm. in depth. There are old anemic infarcts in both kidneys. The stomach and intestines show chronic congestion. On the internal surface of the left half of the dura mater is a well-defined internal hemorrhagic pachymeningitis. The brain is œdematous, but otherwise apparently normal.

Diagnosis. Aortic stenosis and relative mitral insufficiency; advanced fatty degeneration of heart muscle; passive congestion and œdema of both lungs with extinct tuberculous processes in both apices; cyanotic induration of liver, spleen, and kidneys; anemic infarcts of spleen and kidneys; pachymeningitis hæmorrhagica interna; œdema of the brain.

REVIEWS.

MANUAL OF PATHOLOGY, INCLUDING BACTERIOLOGY, THE TECHNIQUE OF POSTMORTEMS, AND METHODS OF PATHOLOGICAL RESEARCH. By W. M. L. COPLIN, M.D., Professor of Pathology and Bacteriology, Jefferson Medical College, Philadelphia. Fourth edition. Pp. 994. Philadelphia: P. Blakiston's Son & Co., 1905.

SINCE 1895, when the nucleus of this book appeared as a series of abstracts of the author's lectures on pathology, the work has rapidly grown until it has reached in this fourth edition a volume of almost a thousand pages. In spite of the increase in size the author has adhered more or less to his original plan, and has designed his work as a manual which may be useful in the laboratory and postmortem-room, and not as a treatise or book of reference. One might suggest that the manual had at least reached the proportions of a text-book. The great scope of the text makes a detailed review almost impossible. Quantities of new material have been added and the chapters abound in references to researches published within the last few years or even months. Certain portions of the book have been entirely rewritten. Other parts have been revised and changes have been made in the arrangement of the text. The chapter on General Laboratory Technique has been arranged as an appendix. Among the many additions which may be noticed are a chapter on Abnormalities, discussions upon the spirochaetae, trypanosomes, many statements regarding tuberculosis, arteriosclerosis, diseases of the thyroid gland, and a host of others too numerous to mention. There are also many satisfactory new illustrations, and some new colored plates. The book should be very helpful to the student and the practitioner.

W. T. L.

A HAND-BOOK OF CLIMATIC TREATMENT, INCLUDING BALNEOLOGY. By WILLIAM R. HAGGARD, M.D., F.R.C.P. Lond.; Consul at Davos, Switzerland. Pp. 536. London: Macmillan & Co., Ltd., 1906.

THE chief aim in this book is to place the therapeutics of climate on a secure foundation which, being accomplished, the physician can readily note the principles of choice in the selection of resorts, baths, and mineral waters. Meteorology is discussed under chapter headings on atmosphere, temperature, humidity, pressure, electricity,

and the general influences affecting climate. This section is, of necessity, more or less dogmatic. Having laid this foundation, the physiology of climate suggests certain general considerations, such as the influence of temperature on metabolism, the action of atmospheric humidity, of atmospheric pressure, and of light, and finally the reactions of the organism to various climatic influences. The factors of climate and the physiological influence of these factors having been analyzed, the next step is to determine what the final result of various combinations will be. The classification which the author adopts is based on the heat demand (or demand for tissue change), which may be excessively small, small, medium, large, or excessive. It is pointed out that from this standpoint different positions in a geographical division may at different seasons offer more than one type of climate. Geographically, Egypt, South Africa, Algiers, Madeira and the Canaries, the Mediterranean, the British Isles, the United States, the Alps, and the ocean are considered. In the preparation of this section much reliable testimony has been collected and thoroughly sifted. Baths and mineral waters are amply treated. Of the waters used internally the depurative group is divided into (1) ablent, (2) stomachic and diuretic, and (3) mild intestinal stimulants, while the toxic and reconstituent group comprise the (1) hematogenic and (2) alternative and nervine. The final chapter in this part is upon the whey cure and the grape cure on which formerly considerable was written. The application of all the foregoing, the therapeutics, is found under various disease headings, and the book ends with some general remarks which we regard as so important that they should be read not only with reference to this, but to any other work upon this subject. These we may briefly condense in stating that the name of the disease never suffices to indicate the appropriate remedy, that there must be a general physiological stock-taking, and when this is done our efforts must, in the main, be directed toward restoring disordered function and the malady must be traced to its source. Further, extra medical points must be considered, as financial conditions, mental states, suitability of environment, etc. We commend this volume to our readers as one which will command their attention to their profit and their interest to their more scientific information.

R. W. W.

A MANUAL OF CHEMISTRY, INORGANIC AND ORGANIC. By ARTHUR P. LUFF, M.D., F.R.C.P., and FREDERICK JAMES M. PAGE, B.Sc. (Lond.), F.I.C., Associate of the Royal School of Mines. Third edition. Chicago: W. T. Keener & Co., 1905.

This manual is not new, having been first published in 1892 and having gone through a number of editions and rewritings until the

edition of 1905 is practically a new book; it has the added value of years of usage and the accumulation of new material, bringing it up to date.

The work is intended as a guide to the study of chemistry for students in medicine. The author has accomplished his purpose with remarkable success. The book is divided into six parts, of which the first, entitled "Introduction to the Study of Chemistry," deals with the fundamental principles and laws underlying the science, and treats of such things as elements, symbols, molecules, atoms, quantivalence, molecular and atomic theories, use of symbols and formulae, and the writing of chemical equations. The laws of chemical combination and the laws of combining of gases by volume are also treated. Part II consists of a fairly comprehensive treatment of the non-metallic elements and their compounds. Part III treats of the metallic elements and their compounds.

Part IV is devoted to a study of organic chemistry. The ground is remarkably well covered in the 146 pages devoted to it. This is a most important section of the book. The domain of this branch of the science is vast and reference-books on the subject are necessarily very large. We are given here a condensed treatment of the subject, which is most admirable. The physical methods employed are described in sufficient detail and the various classes are treated in a way quite sufficient to meet the need of the medical student. This also contains descriptions of such modern drugs as aspirin, heroin, mesotan, veronal, etc. The alkaloids, such as morphine, codeine, strychnine, etc., are also described and tests given for their presence.

Part V is devoted to theory, stoichiometrical problems being plainly explained, as well as problems involving volume calculations of gases, correcting for temperature and pressure, and determining the weight of a liter of gas, as well as various miscellaneous problems. A table of the equivalents of the chief weights and measures, including the metric, is given.

Part VI is concerned with the preparations of typical salts, and contains tables of qualitative analysis for the various groups of metals as well as examinations for the commonly occurring acids. Blow-pipe tests are also given. This section is completed with a brief description of the preparation and use of normal solutions in volumetric analysis. The chief indicators are given, with statements as to the action of certain substances which affect them. Practical examples are given of the volumetric analysis of various materials.

Although the book is a remarkably comprehensive one there are of course certain occasional omissions, as for example the preparation of oxygen gas by the action of water on sodium dioxide. The use of such radicals as Am and Cy is certainly to be depre-

ciated, although the student will probably know that they stand for "ammonium" and "cyanogen" respectively.

The book can be recommended to the medical student as a most valuable and comprehensive treatment of the inorganic and the organic branches of the science.

E. A. C.

A TEXT-BOOK OF MEDICAL CHEMISTRY AND TOXICOLOGY. By JAMES W. HOLLAND, A.M., M.D., Professor of Medical Chemistry and Toxicology, and Dean, Jefferson Medical College, Philadelphia. Pp. 592. Philadelphia and London: W. B. Saunders & Co., 1905.

THE field covered in this handsome volume embraces both the inorganic and the organic domain of chemistry, with especial attention to toxicology in every case where the substance under consideration has toxic properties. Not only is the toxic dose given, but the antidote is stated and that most important subject to the practical man, the so-called "incompatibilities," are fully developed.

The first sixty pages are devoted to physics in its relation to the sister science of chemistry. A study of the principal elements, both metallic and non-metallic, then follows, with the chief compounds that they form. Chemical theory is brought in at suitable places and the principles and most important laws are clearly explained and thoroughly and adequately treated. The most recent theories are described. Fully half of the contents of the book is devoted to the branch of organic chemistry. A large number of compounds are fully described and the medical properties are particularly noticed. The very handsome colored plates form a distinctive feature of the book. These show the principal chemical tests and the shade of color is very accurate in each case.

E. A. C.

THE PREVENTION OF SEXILITY AND A SANITARY OUTLOOK. By SIR JAMES CRICHTON-BROWNE. London and New York: Macmillan & Co., 1905.

THE first of these two addresses, the reading of which makes one wish he could have been present at their delivery, deals with a subject of universal interest that has recently been brought into public discussion by the unfortunate misconstruction of Professor Osler's famous chloroform joke. In his happiest manner the author takes exception to the claim that most of the efficient work of the world has been accomplished by men under forty years of

age and cites a multitude of instances in support of his point. Metchnikoff's phagocytes and the role they are supposed to play in the process of senility come in for their share of raillery and, in gentler terms, Dr. Allechin's enzyme also. Longevity is to be attained, if at all, by obedience to the laws of health, by leading a life of physiological righteousness, as it has been aptly put, not by the use of serums and elixirs. The normal term of human life should not be the biblical "three score years and ten," nor Metchinkoff's 120, but "every man is entitled to his century and every woman to a century and a little more."

In the second address, on the sanitary outlook in England, after scoring the pessimism of those who refuse to admit the advances that had been made in the prevention and treatment of tuberculosis, and especially condemning the thoughtless expression of such views in public meetings, the author reviews the advances in sanitary science and devotes himself more particularly to the question of the housing of the poor, both in the city and in the country, and the problem of overcrowding in large industrial centres. The remedy will ultimately be found in increasing the facilities of locomotion and building up suburbs where those who are not compelled to live near the factory or shop can have cheap and comfortable homes. A necessary condition for such suburban residences is a shortening of the working day. As to the city itself, much can be done to improve its hygiene. In addition to parks and open places, broad avenues free from buildings and covered with vegetation should be maintained. "The parks and open spaces in our cities are called their lungs, but the lungs are not of much use without the wind-pipe, and the green avenues, I suggest would act in that capacity, and allow an inrush of fresh air and the escape of the vitiated air which is always accumulating in cities." The preservation of vegetation, not only in cities but in the country generally, is becoming a matter of some importance, and the author looks forward with alarm to the time when we shall be entirely dependent on imported oxygen as well as imported food, and shall have to trust to the ocean to dispose of our surplus carbonic acid.

The essays sparkle with humor, and the author's hope, expressed in the preface, that they may be deserving of more than the hebdomadal remembrance which a congress confers is fully justified.

R. M. G.

THE INFLUENCE OF GROWTH ON CONGENITAL AND ACQUIRED DEFORMITIES. BY ADONIRAM BROWN JUDSON, A.M., M.D.
New York: William Wood & Co., 1905.

THIS is a most interesting and pleasing presentation of the personal view, of a large and long experience, and of the author's

methods of treatment of the deformities of club-foot, infantile paralysis, tuberculous joint disease, and scoliosis.

The history, pathology, and mechanics of etiology and of corrective treatment are set forth very clearly in text and illustration. It is delightfully told and is plainly the outcome of careful study. It is most instructive in its graphic records of conditions observed and results obtained in the same cases from infancy to adult life. The book can be read with much advantage by every orthopedic student, who will learn from it the advantage and necessity of recognizing and treating deformity at the earliest possible period, and with unremitting care and adaptation of apparatus to the varying requirements of each case.

J. M. S.

A MANUAL OF THE DISEASES OF INFANTS AND CHILDREN. By JOHN RUHRÄH, M.D., Clinical Professor of Diseases of Children in the College of Physicians and Surgeons, Baltimore. Philadelphia and London: W. B. Saunders Co., 1905.

IN the manual before us, Dr. Ruhräh has succeeded in compressing into about 400 pages a very succinct review of the subject of pediatrics, intended especially as a guide to study and a ready reference-book for the student of medicine. Himself a practical teacher, Dr. Ruhräh has well appreciated the need for condensation in the presentation of a subject which, for present conditions at least, must assume for the student a subsidiary place in the curriculum of his college course; and he has succeeded very admirably in presenting the salient features of each disease in a concise and readily memorized form.

The subject of treatment, which appeals most strongly to the student mind, has been satisfactorily covered, being quite in accord with the best teaching, yet withal broadly general and free from stock prescriptions, except those the use of which has become almost classic. The subject of infant feeding is adequately presented in a section covering forty pages. There are more than one hundred illustrations to elucidate the text, about a third of which are original; the others are borrowed from approved authorities, and among them one pleasantly recognizes the faces of old friends.

A rather novel feature of the work is the numerous references to recent journal articles, which serve to stimulate further research into the rich literature of the subject, and, by way of appendix, a special section has been added giving a list of the principal English and foreign reference works and journals devoted to pediatrics, together with the methods of looking up subjects in the *Index Catalogue* and the *Index Medicus*.

Altogether this manual seems to us to be one of the best of its class; and as it is the latest, it should receive a flattering reception in the student world.

T. S. W.

THE MICROTOMIST'S VADE-MECUM: A HAND-BOOK OF MICROSCOPIC ANATOMY. By ARTHUR BALLES LEE. Sixth edition. Philadelphia: P. Blakiston's Son & Co., 1905.

THIS valuable little book has now passed through six editions, and though the first publication appeared twenty years ago, in all this time no book has been written in English which usurps its position or which covers exactly the same ground. From the number of books describing laboratory methods and microscopic technique it differs in that it appeals rather to the biologist and pure microscopist than to the student of medicine. The book has to do solely with the fixing, cutting, and staining of tissues. Methods of bacteriological and clinical microscopic examination are not included in its pages, and no references are made to the preservation of gross pathological specimens. The general scope of the volume must, however, be familiar.

In the present edition, the first since 1900, much new material has been added; and to include this without enlarging the size of the book, the text has been somewhat condensed in places. Indeed, the chapters contain so much and the subject matter is so condensed that it requires considerable knowledge of the subject for one to use the book to best advantage. Very little advice is given as to the choice of the best of many different methods for special staining. References to the original articles, however, are always quoted and many extra references are given for the benefit of those who wish to investigate certain methods of technique more fully.

Some of the chapters, as for instance those on the "Connective Tissues" and "Blood and Glands," have been rewritten, while particular attention has been given to the chapters on the nervous system, which are now very full and much more satisfactory than those on the connective tissues and the blood. The latter chapter is really quite meagre as compared to the chapters upon this subject in most books upon the clinical examination of the blood. In the chapter on connective tissues Mallory's useful aniline blue stain is conspicuous by its absence. The use of acetone for rapid hardening and fixation receives little attention, while the new and important methods for making frozen sections are scarcely referred to. In other respects the book contains a wealth of material and still holds a more or less unique position.

W. T. L.

MATERIA MEDICA, PHARMACY, AND THERAPEUTICS. By SAMUEL O. L. POTTER, A.M., M.D., M.R.C.P. Lond.; formerly Professor of the Principles and Practice of Medicine in the Cooper Medical College of San Francisco, etc. Tenth edition. Pp. 914. Philadelphia: P. Blakiston's Son & Co., 1906.

A BOOK covering these subjects is of necessity revised that its materia medica shall conform to the new and thorough revision of the United States Pharmacopœia, and rewritten that its therapeutics shall keep in consonance with the rapid and substantial advances in the art of healing. It is no formal statement of the author that this has been done, for scarcely a page remains unchanged. That this work has been performed with discretion, one who has read every edition and reviewed most of them can attest. Each edition shows the more extended reading and riper experience of the author, and that his efforts have met with due appreciation by the reading practitioner the number of editions is ample evidence. For him this volume is well adapted for study and ready reference. That we still believe it a most valuable work for those who more especially need its guidance we quote what we have said upon a former occasion: "The author has very skilfully steered his course between the pessimism that marks a system of therapeutics, based solely on the results given by experiments and observations in the chemical and physiological laboratory, and the optimism of hasty, empirical generalization upon meagre clinical data, and upon this we consider that the greatest claim can be made that this book is a safe one for the junior practitioner."

R. W. W.

CLINICAL METHODS. A GUIDE TO THE PRACTICAL STUDY OF MEDICINE. By ROBERT HUTCHINSON, M.D., and HARRY RAINY, M.D. Ninth edition. Chicago: W. T. Keener & Co., 1905.

It is not often that one can unqualifiedly recommend for general use a small work on diagnosis. An exception must, however, be made to this the work of Hutchinson and Rainy. Although concise nothing could be more comprehensive in its consideration of diagnosis from the clinical side, and one is pleased to see throughout attention and mention given to a host of diagnostic points frequently omitted in larger works—such as Harrison's groove, the flitten diaphragm phenomenon, mucomembranous colitis, tests for occult blood in the feces, nitrogenous excretion, cryoscopy, etc.

The best feature, however, is the accurate description of all

tests and methods. One must mention in this connection the section on the taking of pulse tracings; and the chapter on the blood, the plates of which cannot be excelled in any work on general diagnosis. The section devoted to the examination of sputum and feces, which in most works stand practically unaltered year after year, are refreshing in their practical applicability and in the evident fact that the authors have worked out the examinations of the various conditions, instead of merely copying from or referring to other older works on the subject.

The general diagnosis, the consideration of pulmonary, cardiac, and thoracic conditions are excellent and helped by numerous illustrations and carefully printed and anatomically correct plates. The description and history of the numerous adventitious sounds of the heart and lungs are remarkably full and good for a small work.

The work ends with a particularly readable chapter on diagnosis of diseases of the nervous system (with several excellent plates and a good description of electrodiagnosis), the examination of exudates and transudates, and clinical bacteriology. The latter are rather brief; one misses consideration of cytodiagnosis, and mention at least of paracolon and paratyphoid disease. A simple clinical discussion of disorders of the intestine, such as monads, cercomonads, etc., is unfortunately omitted from the book.

As a student's hand-book we have no hesitation in recommending it to our classes, since the accuracy of description of tests, reagents, stains, etc., will save much misunderstanding.

N. B. G.

MATERIA MEDICA AND PHARMACY. By REYNOLD WEBB WILCOX, M.A., M.D., LL.D., Professor of Medicine in the New York Post-graduate Medical School. Sixth edition, based on the fifth edition of White and Wilcox's *Materia Medica and Therapeutics*. Philadelphia: P. Blakiston's Son & Co., 1905.

THIS work has been written as a companion volume to *Pharmacology and Therapeutics* by the same author. Owing to the extensive changes which have been required to bring the sixth edition into harmony with the last volume of the United States Pharmacopœia the entire work has been recast, and has been divided, as is stated above, into two volumes. In the part under review, the subjects are considered from a pharmaceutical standpoint and include the various kinds of preparations, their dosage, and the art of prescribing; then follows a description of the remedies in detail. Therapeutic agents are divided into two main parts, under the headings of Inorganic and Organic Materia Medica,

and they are grouped according to the class and chemical division, or natural order, to which they belong.

The work embodies in a most excellent manner all the essential facts upon the various subjects in the light of the most recent investigations. The descriptions given, which are terse and to the point, are made readily accessible by means of a very complete index. A valuable feature of the book is the description of numerous proprietary remedies, together with their proper chemical names and methods of manufacture. The book can be cordially endorsed as a most useful work of reference which will improve on acquaintance.

G. W. N.

THE TREATMENT OF DISEASES OF THE EYE. By DR. VICTOR HANKE, First Assistant in the University Eye Clinic of Hofrath Professor E. Fuchs, in Vienna. Translated by J. HERBERT PARSONS, B.S., D.Sc., F.R.C.S., Assistant Ophthalmic Surgeon, University College Hospital, and GEORGE COATS, M.D., F.R.C.S., Chief Clinical Assistant, Royal London (Moorfields) Ophthalmic Hospital. Chicago: W. T. Keener & Co. London: Hodder and Stoughton, 1905.

THIS epitome upon the treatment of diseases of the eye and something more—for it also contains a short description of the symptoms, diagnosis, etc., of most of the affections considered—takes up the diseases of the different structures themselves in alphabetical order. It is difficult to conceive how such a task could be better accomplished than it has been done in this little book by its German author and English translators.

At the same time excellent as is the compend it well illustrates the limitations of all attempts to teach a specialty by such means. The general practitioner, for whom the author primarily intends this work, will undoubtedly gain considerable information from it about the subjects of which it treats, but it is very doubtful whether the knowledge so acquired will be of much use to him or his patients in the treatment of the diseases of the eye. Many of the subjects are so special that they cannot be taught from books alone—much less from one which contains no illustrations and in which the descriptions must be as brief as possible. The translators' suggestion that "the book provides a *resume* of the methods adopted in Fuchs' clinic, in Vienna, and will, therefore, be of interest to ophthalmic surgeons also" is very much to the point. This class will no doubt read it with lively interest. If such compends are to be published, however, the present one is a type of what they should be.

T. B. S.

PROGRESS OF MEDICAL SCIENCE.

MEDICINE.

UNDER THE CHARGE OF

WILLIAM OSLER, M.D.,

REGIUS PROFESSOR OF MEDICINE, OXFORD UNIVERSITY, ENGLAND.

AND

W. S. THAYER, M.D.,

PROFESSOR OF CLINICAL MEDICINE, JOHNS HOPKINS UNIVERSITY, BALTIMORE, MARYLAND.

New Method in the Biological Diagnosis of Infectious Diseases.—

During the past year several articles have appeared dealing with a new method for the diagnosis of infectious diseases, which depends upon a principle apparently of very great importance. It is another application of a method devised by NEISSER and SACHS for the determination, for medico-legal purposes, of the source of specimens of blood. (*Berl. klin. Woch.*, 1905, xlii, 1388.)

If the inactivated blood serum of an animal (for instance, the rabbit), immunized to the blood corpuscles of a second species (say the sheep), is added to a suspension of corpuscles of this second species, hemolysis, of course, occurs when a small amount of fresh, normal serum (guinea-pig, for instance), containing complement, is added. If, however, the fresh normal (guinea-pig) serum (complement containing) be first added to a mixture of the serum of a rabbit immunized to human serum, and then the smallest trace of human serum be added to this, and allowed to stand at 37° C. for a time; and if, then, *this* mixture be added to the above described mixture of corpuscles and immune serum, no hemolysis occurs. If, instead of human serum, or that of an ape, any other kind of serum be added, there is no change in the result; hemolysis goes on as before. In other words, the complement has lost its power to act, by having added to it a mixture of human serum and anti-human serum. It was found that it required only a minimum amount of human serum to carry out this test; 1/10,000 c.c. always sufficed; at times even 1/1,000,000 c.c. was sufficient, and the result was very striking. It is thus seen that the method possesses very decided

advantages over the precipitin reaction of Uhlenluth and that of Wassermann and Schütze.

A somewhat similar reaction had previously been described by Mor-eschi and by Bordet and Gengou, but they did not recognize the application, and explained it in a somewhat different way. Neisser and Sachs think it depends upon a principle first advanced by Ehrlich and Morgenroth, namely, that amboceptors alone are unable to bind complement, but by becoming anchored to the substance used for immunization (antigen) they undergo such an increase in avidity that they are now able to attach the complement. It is this binding of the complement and so its deflection from the corpuscles to which the hemolytic amboceptors are attached, that prevents hemolysis.

It is quite evident that if this principle be correct, we can not only determine the presence of the specific serum in an unknown blood, but on the other hand, given this specific serum, we can determine whether in a second serum anti-bodies for this serum be present or not; in other words the reaction works both ways, either to demonstrate the presence of the antigen (the immunizing substance) or of amboceptors, when either one is known to be present.

Wassermann and Bruck (*Med. Klinik*, 1905, No. 55) now made a wider application of this principle to detect, not specific serum albumins, or their anti-bodies, as in the Neisser-Sachs application, but to detect the presence or absence of minimal quantities of dissolved bacterial substances or of their corresponding anti-bodies or amboceptors. Thus, if to a watery extract of typhoid bacilli, the serum of a patient with typhoid fever and complement-containing serum be added, and if after waiting a short time it be found that the complement has been bound (since it is now no longer able to activate hemolytic sera) we may conclude that in the patient's blood there are present amboceptors corresponding to the dissolved bacterial substances. On the other hand, with this method it is possible to detect small amounts of the bacterial substances in the body-fluids. Thus, if to the serum of a patient, under proper controls, and in varying quantities, the serum of an animal highly immunized to typhoid bacilli (therefore containing amboceptors) be added, and if to this we add fresh complement, if later it be found that the complement is bound (by the method previously described), we may conclude that in the serum of the patient dissolved bacterial substances were present, which were able to unite with the amboceptors. They have found such conditions to occur.

They have applied this method to the study of tuberculosis, especially to the study of the action of tuberculin (*Deut. med. W'och.*, 1906, xxxii, 449). By this method they demonstrated the presence of anti-tuberculin in tuberculous organs. In the blood of untreated patients with pulmonary tuberculosis, however, no anti-tuberculin could be demonstrated. On the other hand, during the course of treatment of tuberculous patients with tuberculin, specific anti-tuberculin appeared in the circulating blood. In a most interesting way they apply their findings to a theoretical discussion of the action of tuberculin, and the theories set forth seem to agree with the facts as known. Since usually the anti-tuberculin is obtained only in the tuberculous organ and not throughout the body, all of the tuberculin must be attached in this situation. This explains why such small doses of tuberculin are active. For instance, suppose a person with lupus reacts to 1 milligram

of tuberculin, as is often the case. This small amount, when diluted in the blood of an ordinary sized man, makes a dilution of 1 in 5,000,000 (about). Such a dilution, however, injected directly into a tuberculous focus causes no reaction. The above observation seems to offer a good explanation for this. An explanation for the local reaction, which is manifested by a softening and rendering homogeneous of the tuberculous tissue, is also given. It is supposed that this is due to the fact that by the union of the tuberculin and anti-tuberculin, complement is bound. Now it is known that wherever by means of amoebocytes complement is concentrated and active, organic albuminous substances are dissolved, digested. This is to be considered not only due to the action of the free digesting substances obtained by the breaking down of the leukocytes, but also to the digestive power of the leukocytes themselves, which are attracted to the part and which produce the small, round-cell infiltration about the node. The general reaction, the fever, is thought to be due to the absorption of the soluble products of this digestion. The reason, therefore, that the tuberculous react to much smaller doses than the healthy is that only with the former does acute reabsorption occur. If anti-tuberculin were present in the blood in sufficient amounts no reaction would occur. This not infrequently does happen after previous treatment with tuberculin, and explains why persons with relatively fresh tuberculous processes react best. They show, experimentally, that after tuberculin treatment anti-tuberculin appears in the circulating blood, with greatest readiness in cattle, less readily in guinea-pigs, and least readily in man. The fact with regard to cattle has been taken advantage of, so the writers state, by unscrupulous exporters of beef to Germany. By giving cattle a dose of tuberculin before starting, they fail to react to a second dose when they arrive in Germany, even if they are tuberculous. The writers think this is due to the appearance of anti-tuberculin in the blood, and they propose to detect such tuberculous cattle on their arrival at quarantine, not by the tuberculin test, but by the detection of anti-tuberculin in the blood, by the method of complement deflection ("ablenkung").

It is unfortunate, so far as the clinical diagnosis of tuberculosis is concerned, that tuberculin or anti-tuberculin is not present in the blood of the untreated, as in that way a ready method of diagnosis would be at hand. Bruck (*Deutsche med. W'och.*, 1906, xxxii, 945), however, has shown that while this is true for local tuberculosis, in general miliary tuberculosis this is probably not the case, as by the method previously described he was able, in the early days of a case of acute miliary tuberculosis, to detect in the blood specific substances of the tubercle bacillus, and so to make a definite diagnosis at a time when, by previously employed methods, it was not possible to do so. It is of interest that during the course of the disease the reaction disappeared, but at the same time the presence of anti-bodies could be demonstrated. Before exitus, however, these disappeared, and the bacterial substances were again demonstrable. During the period when anti-substances were present, the patient's condition seemed to be better.

Further, by this method Bruck has frequently succeeded in demonstrating the presence of soluble substances of the tubercle bacillus in pleuritic exudates and so determining their nature when this was possible in no other way. Also in the spinal fluid of two cases of cerebrospinal meningitis he was able to detect, by means of a specific meningococcic

serum, the presence of meningococcic bacterial substances. So, also, in streptococcic infections analogous specific substances have been detected in the blood.

Lastly, Wassermann, Neisser, and Bruck (*Deutsche med. Woch.*, 1906, xxxii, 745) have applied this method to the study of syphilis, and although the communication is only a preliminary one, it seems to be of very great importance. By proper methods they have produced an immune serum in apes, and have proved by means of complement deflection (1) that in the serum there are present anti-bodies to specific syphilitic substances, and (2) in the extracts of tissues such substances may be demonstrated. This, therefore, offers a possible sero-diagnostic reaction for syphilitic material, and so is of great value in the experimental study of the disease. On the other hand, it offers a method for determining whether in human serum specific substances are present. The tests so far in this direction have been inconclusive, but the power of the immune serum will be of great importance in the successful carrying out of this test, and the writers are at present attempting to obtain as active a serum as possible. If it can be shown that in the circulating blood of luetic patients such substances are always present, the diagnostic importance will be great.

Paralysis of the Recurrent Laryngeal Nerve in Mitral Stenosis.—FIRSCHAUER (*Wien. klin. Woch.*, 1905, xviii, 1383) reports the occurrence of complete paralysis of the left vocal cord in a woman, aged thirty years, with mitral stenosis. At autopsy the left recurrent laryngeal was found compressed and degenerated at the point where it curves under the arch of the aorta and passes between the aorta and the left branch of the pulmonary artery. The left auricle was tremendously dilated and the dilated auricle and engorged pulmonary veins, by pressing the pulmonary artery upward and forward, compromised the nerve between it and the arch of the aorta. Ortner, who was the first to call attention to this relation between mitral stenosis and laryngeal paralysis, published in 1897 two instances in which the paralysis of the recurring nerve was due to direct pressure from the enlarged left auricle. In one instance the left bronchus was pushed forward and lay directly upon the auricle and was itself somewhat flattened. Krauss, in a later publication expressed doubt as to the possibility of the auricle itself ever pressing directly upon the recurrent nerve. But Hofbauer, to sustain Ortner's view, has narrated an instance in which with great hypertrophy of the left auricle the tip appeared between the aorta and the pulmonary artery and at autopsy had to be pulled from between them. In a case reported by Krauss and in another by von Schröter the nerve was pressed upon by the ligamentum botalli. In Krauss' case the ligament ran more directly backward than normal, so that the nerve as it turns to loop about the aorta instead of lying beside it crossed over it, and as the pulmonary artery was pushed upward and forward by the enlarged left auricle the nerve became compressed between the ligament and the left main branch of the pulmonary artery. In von Schröter's case the pulmonary artery was markedly dilated and was larger than the aorta. The ductus botalli was patent, and as large as the main branches of the pulmonic. The recurrent nerve was caught in the outer angle of the point of origin of the ductus and compressed between the distended vessels.

SURGERY.

UNDER THE CHARGE OF

J. WILLIAM WHITE, M.D.,

JOHN RHEA BARTON PROFESSOR OF SURGERY IN THE UNIVERSITY OF PENNSYLVANIA;
SURGEON TO THE UNIVERSITY HOSPITAL,

AND

T. TURNER THOMAS, M.D.,

ASSISTANT SURGEON TO THE UNIVERSITY AND PHILADELPHIA HOSPITALS, AND ASSISTANT
INSTRUCTOR IN SURGERY IN THE UNIVERSITY OF PENNSYLVANIA.

The Leukocytic Effect Provoked in a Septic and Atonic Wound by Dressings of Sterilized Serum of the Horse (Method of Raymond Petit).—JAYLE (*Journal de Chirurgie*, December, 1905) says that an efficacious treatment of these wounds has not yet been established. Very many topical applications have been employed, but in spite of them the wound remains dark, grayish, or white, and does not granulate. After the use of this serum by the writer the reparative action was so rapid and so evident that he considers it very useful for this purpose.

According to Metchnikoff the micro-organisms are destroyed by the white blood corpuscles. The microscopic examination of the blood of a septic atonic wound shows the absence of the leukocytes. The microbes increase abundantly and produce their toxins at their ease, and these rapidly poison the body.

Raymond Petit has shown that an intraperitoneal injection of the serum of the horse produces a very marked leukocytosis, and applying this fact to abdominal surgery, he has used the sterilized serum of the horse in laparotomies for septic conditions, or as a preventive against sepsis. He places 20 c.c. of the serum in the abdominal cavity and drains.

Jayle tried the serum in a septic atonic wound of the abdomen. Previously he had tried through dressing of the wound every three hours for thirty hours. There was no change in the wound and an examination of the wound serum showed an absence of all leukocytic reaction. After dressing with the serum of the horse an abundant leukocytosis was produced. The local infection which had resisted the antiseptic dressings, yielded to the physiological phagocytosis thus produced. The wound became clean and red on the third day.

Acute Œdema of the Lungs Secondary to Ether Narcosis.—PEDERSEN (*Annals of Surgery*, January, 1906) says that the sequels of ether are usually of the secondary type. They are most frequently localized in the lungs, usually as a lobar pneumonia; or in the kidney, as the various forms of congestion and inflammation.

Acute œdema of the lungs is one of the immediate sequels of ether narcosis, and while comparatively rare, must be reckoned with. In the case reported by Pedersen the whole process appeared to have found its origin in the air vesicles, to have reached its acme there, and to have run its course and ended there. The most effective features in the treatment during the crisis were a large dose of nitroglycerin (gr.

hypodermically), moderate elevation of the foot of the bed, and very active dry-cupping all over the chest. The patient recovered. Pedersen believes that exposure during the operation at any time, excepting as is absolutely necessary, and during convalescence from the anesthetic, in any way, is extremely hazardous. Any exposure which tends to check active perspiration must be very dangerous to both the lungs and kidneys. Deliberate uniform administration of the anesthetic is important.

Perforation of the Gall-Bladder (MACLAREN). The Value and Place of Duodenocholedochotomy in Gallstone Surgery (HANCOCK) (*Annals of Surgery*, January, 1906).—MACLAREN says that most perforations of the gall-bladder occur in long-standing, neglected cases of gallstones. A secondary cholecystitis in an attack of typhoid fever brings the added risk of perforation. Of 539 operations on the gall-bladder and bile ducts, by Robson, twenty-five may fairly be classed as perforations. MacLaren operated on eighty cases of gallstones, of which ten were perforative. One of these, however, was found postmortem. In perforation with abscess it is best to open and drain the abscess, waiting until later to deal with the gallstones or the disease of the gall-bladder. As soon as the diagnosis is made in non-perforative cases, the gallstones should be removed, in the interval, to lessen the dangers of complications.

HANCOCK has collected sixty-two cases of transduodenal choledochotomy, done since McBurney performed the first operation in 1891. Forty-one, or more than two-thirds, have been done since 1900, showing that the operation has found its place among established procedures. The mortality in these cases is placed at 8.77 per cent. That of Robson for choledochotomy was 16.2 per cent. but recently has been lowered to 5 per cent. Kehr's mortality is 6.5 per cent. and the Mayos 11 per cent.

It is advantageous in some cases to perform a combined supra- and transduodenal choledochotomy, when stones are distributed along the common duct, and to finish by drawing gauze strips through the duct to sweep it clean. The anatomical difficulties associated with the retroduodenal operation often make it dangerous and uncertain, and therefore less advantageous than the transduodenal.

A Study of a Particular Form of Primitive Tuberculosis of the Kidney. The Polycystic Tuberculous Kidney.—CURTIS and CARLIER (*Annales des Malades des Organes Genito-Urinaires*, January 1, 1906) say that the term cystic tuberculous kidney should not be employed in renal pathology, with reference to old cavernous or hydronephrotic lesions occurring in the course of tuberculosis. A pseudocystic condition may result, but not a true cystic kidney.

They describe a tuberculous polycystic kidney, which is characterized by its chronicity, hypertrophy of the kidney, and the abundance of cysts, giving the organ on first sight the appearance of a congenital polycystic kidney. It is due to bacillary emboli, with an ascending invasion of the pyramids and scleroepithelial and cystic transformation. The pelvis and calyces becoming involved, the papillae are reinoculated, whence an ascending intra-canalicular and extra-canalicular tuberculosis is produced in the pyramids.

A Typical Disease of the Tendo Achillis.—DREHMANN (*Zentralblatt f. Chirurgie*, January 6, 1906) has often seen the condition recently described by Schanz. The typical seat of the trouble is about a hand's breadth above the heel, about at the top of the modern shoe. Drehmann has seen it affect the two sides of the body most frequently, and believes that it is due to irritation, as by the top of the shoe. He considers it analogous to the circumscribed tendinitis seen usually among the one-year volunteer soldiers in the finger used for snapping the gun trigger. He does not agree with Schanz that it is due to a stretching or incomplete rupture of the tendon, which requires a powerful muscular contraction, as in jumpers and circus riders. Such ruptures are usually close to the insertion of the tendon or at its junction with the muscle.

A Special Form of Disease of the Tendo Achillis Allied to Gout and Rheumatism.—BARACZ (*Zentralblatt f. Chirurgie*, January 6, 1906) says that he has observed this affection, particularly in rough, winter weather, and in gouty and rheumatic people. The overlying skin is more or less reddened, according to the severity of the condition. Some patients suffer from it repeatedly, and some have a relapse every winter. Many suffer at the same time from joint and muscular rheumatism. It occurs suddenly and unexpectedly. Overuse of the tendon, as from much walking before the onset of the attack, can often be shown. Both sides are often involved, either together or one after the other. Baracz has seen it occur on one side, with and without concomitant involvement of the joints or bursæ. The treatment will vary according to the severity of the case. Locally it will vary from regular rubbing and liniments to fixation of the foot with plaster or even rest in bed.

Concussion of the Brain (so-called) and its Treatment.—THOMAS (*Liverpool Medico-Chirurgical Journal*, January 1906) says that it is difficult to realize the great general depression produced by cold applications to the head. The patient may be kept from "coming to" by diligently renewing the cold application. Shock and ordinary concussion are one and the same thing, so that ice-bags are not indicated. Severe concussion or continued unconsciousness implies definite naked eye lesions of the brain or meninges, and gives symptoms which differ from those of ordinary surgical shock. Ice-bags applied to the head are of service here, as a general depressant, and not for any direct effect on the cerebral circulation. Loss of control of the bladder and rectum is rare in contusion, but might be considered characteristic of contusion. A sudden rise of temperature is always suggestive of meningitis.

Some Thoughts and Suggestions Concerning "Gastric Ulcer."—MACALISTER (*Liverpool Medico-Chirurgical Journal*, January, 1906) calls attention to the greater frequency with which vessels are perforated in gastric ulcer, when we consider how resistant the arteries are to ulcerative processes in general. The author does not believe that a perforating gastric ulcer takes origin in a superficial erosion. Virchow, in 1853, suggested embolic plugging of the vessels as the immediate cause. Macalister thinks that perforating ulcer is a local manifestation

of a general condition which originates before the gastric disorder takes place at all. The fact that it is so frequent in young girls and so rare before puberty has led him to associate it with certain conditions observed before menstruation begins. There is an enlargement of the thyroid gland, and for a considerable period the patient loses her usual robustness. Every now and then she gets blue or purple hands and fingers, some facial lividity, and at the same time she suffers from coldness of the feet. Amenorrhœa is frequently an antecedent to and an accompaniment of gastric ulcer. The administration of thyroid extract or the dried gland, in a large number of cases, causes the menstruation to be re-established when it has been in abeyance for months. With the re-establishment there is frequently disappearance of the Raynaud-like symptoms and improvement in the general health. This suggests that the pathology of gastric ulcer is a toxic or chemical one, as distinct from a mechanical or infective one.

The Treatment of the Duodenal Stump in Billroth's Second Method of Resection.—STEINTHAL (*Zentralblatt f. Chirurgie*, December 16, 1905) says that he has operated on eleven patients by this method. Four died, one four days after the operation of pneumonia, one on the third day of cardiac insufficiency. In the latter, owing to a failure to turn in completely the divided end of the duodenum, a tampon was placed over it. At autopsy this was stained with bile, showing a leakage of the suture line. There was no peritonitis. In another case, owing to similar difficulties, the suture line was covered with omentum and the abdomen closed. At autopsy about 0.3 liter of turbid serous fluid was found in the right pleural cavity. About the duodenal stump was found a well circumscribed purulent peritonitis. By pressure intestinal contents could be forced from the stump. In the fourth case, the confused duodenal end was closed by a ligature and reinforced by a double row of Lembert sutures. It was then covered with omentum and the abdomen closed completely. For seven days the progress was favorable, on the eighth day some distention of the abdomen appeared, and on the ninth day some pus escaped from the wound, which on the following day was bile-stained. The septic symptoms increased and the patient died four months after the operation. Autopsy showed the left lung considerably shrunken, the whole base adherent to the diaphragm, and the whole lower left lobe infiltrated with pus. The right lung was sound. Two liters of purulent serum was found in the abdomen. The small intestine, from its point of anastomosis with the stomach to within 60 cm. of the cecum, had passed upward through the opening in the mesocolon.

Thus three deaths were due to leakage at the duodenal suture. The first did not show peritonitis; death was due to heart weakness. In another the incarceration of the intestines by the opening in the mesentery led to distention of the duodenum and leakage at the suture. Only the remaining case can be construed as a typical case of suture insufficiency of the duodenal stump, and in this case no tampon was employed.

Of five patients in whom the tampon was used, only one died; death was not due to insufficiency of the suture. Of six patients in whom the tampon was not employed, three died; only one death was due to true suture insufficiency. Steintal believes that when the tumor calling for the operation is strictly confined to the pylorus, in which

it is not necessary to separate the duodenum from the surrounding structures, especially the pancreas, and when there is sufficient peritoneal covering on the posterior surface to permit a safe and complete turning in of the end of the duodenal stump, complete closure of the abdomen may be permitted. When, however, the opposite conditions exist, and especially if the bloodvessels leading to the duodenum have been injured in the separation of it, it will be best to cover the end of the stump with omentum and to place a gauze tampon. He thinks that this method will give better results than Brunner's extraperitoneal suturing of the duodenal stump, which drags the duodenum out of its normal position and leads to frequent and stubborn fistula formation.

A Case of Chronic Pancreatitis Probably Starting in an Accessory Pancreas.—ROBSON (*Lancet*, December 23, 1905) says that this was a case of interstitial pancreatitis, unaccompanied by gallstones and apparently due to an extension of catarrh from the duodenum up to the pancreatic duct. There was a hard nodule felt in the wall of the duodenum, a not uncommon site for accessory pancreatic glands. A piece was removed during the operation and was proved by the microscope to be pancreatic tissue and not to be malignant. Had the body and tail of the pancreas been involved by the same process, cirrhosis and an unpromising outlook would have resulted. Cannidge's test and the blood examination proved valuable. The patient, after the operation, which included a cholecystenterostomy, did very well and returned to perfect health.

The Surgical Treatment of Tuberculous Glands of the Mesentery.—CORNER (*Lancet*, December 23, 1905) quotes Branson, the most recent contributor to this subject, as saying that large caseous mesenteric glands might be more frequently found than postmortems would indicate, because in life the process is latent though far from unimportant, since it may determine a general infection at any moment. With regard to diagnosis it may almost be laid down that hard, movable tumors in the belly of a child, which are not fecal, are caseous mesenteric glands. Corner says that tuberculosis of mesenteric glands is found most frequently in the ileocecal region. The cecum is the second place of rest for food in the alimentary canal, the stomach being the first; moreover, the cecum is the situation which contains a hundred-fold or thousand-fold more micro-organisms than any other part of the intestinal tract. These facts with the frequency of inflammation in the appendix explain the frequency of gland affections in this region. One of Corner's five cases was in an adult, a rare occurrence. The diagnosis of "functional disturbance" had been made, after renal calculus had been ruled out. The patient left the hospital, but returned later on account of his pains. He was operated on and perfectly cured. Branson says "excepting only the bronchial glands, caseation of the mesenteric glands is the most frequent promoter of tuberculous meningitis." The softened glands should be removed. A mere laparotomy, though frequently thought to be useful, in these cases is a half measure and is not followed by success.

Tuberculous mesenteric glands are always found in association with tuberculous peritonitis in all its forms, although tuberculous glands may be found without any tuberculous peritonitis. They are the result of tuberculous enteritis, not of tuberculous peritonitis.

PEDIATRICS.

UNDER THE CHARGE OF

LOUIS STARR, M.D.,

OF PHILADELPHIA,

AND

THOMPSON S. WESTCOTT, M.D.,

OF PHILADELPHIA.

Cause of Sudden Death in Cases of Eczema.—J. BERNHEIM-KARRER (*Jahrbuch f. Kinderheilkunde*, 1906, lxii, 769) does not agree with Paltan's theory, which finds in hypertrophy of the thymus and status lymphaticus the explanation for all instances in which death occurs suddenly and unexpectedly. He quotes a number of cases from the literature in which slight infections had led to cardiac disturbance, which had been forgotten and later unexpectedly produced a fatal termination. Eczema is one of the infections capable of doing this and in support of this statement he relates the case of a child suffering for some months with weeping and suppurating eczema; no other disease had existed. One day without apparent cause the child seemed weaker than usual and died shortly afterward, no other condition developing. The autopsy showed a very large thymus, turbid, cerebrospinal fluid, and cloudy swelling of different organs. Bacteriological examination of the eczema pus, cardiac blood, fluid from the lymph glands, liver, spleen, kidneys and cerebrospinal cavity showed diplococci, which killed white mice in twenty-four hours. The histological picture of the various organs was that found in acute infections and in the author's opinion this was induced not so much by the bacteria, but by the toxins absorbed into the system for several months. He relates several other cases in which cardiac weakness coexisted with eczema, no other causal factor being present.

A Case of Congenital Sarcoma of the Liver and Adrenal Bodies with Metastases. A fourteen-months-old female child with tumor of the liver came under the observation of A. W. Bruck (*Jahr. f. Kinderheil.*, 1906, lxii, S. 84). Abdominal distention had been present for only two weeks and apart from rapidly increasing weakness no other condition was noted. Sarcoma was diagnosed and confirmed at operation. The autopsy revealed primary masses in the liver, right adrenal body, and pancreas, and metastases in the skull, prevertebral and mesenteric lymph glands; there was a circumscribed hemorrhagic enteritis. Histologically, the masses were found to be of the round-cell sarcoma type. The points of interest in the case were that all bodily functions, appetite, stool and general health remained normal to the last, and nothing was noted until the abdominal distention, three weeks before operation, called attention to the child's condition. The absence of ascites in such cases is due to non-involvement of the vena cava and the main branches of the portal vein.

Angina Ulcero-membranosa Plauti and Stomatitis Ulcerosa.—An extensive study of Vincent's angina leads W. EICHMEYER (*Jahr. f. Kinderheilk.*, 1906, lxii, S. 95) to formulate the following conclusions: (1) There are two varieties—a superficial type limited to the epithelium, and a deeper process associated with membrane formation and ulceration. The membrane consists of necrotic tissue masses and numerous fusiform bacilli, and spirochaetæ are present in pure culture. (2) The relation between this angina and ulcerative stomatitis is noted in the clinical, pathological, and bacteriological conditions. The pressure of the teeth against the gums and oral mucous membrane explains the deep necrosis occurring always in the stomatitis. (3) The angina begins primarily as an atypically placed stomatitis, though it may be combined with a typical ulcerative stomatitis, and in some few cases the tonsillar process has even been traced to a typical occurrence in the mouth cavity proper. (4) No definite decisions can be made regarding the bacteria of the disease. The fusiform bacilli are the producers of the characteristic symptom-complex, but their relation to pyogenic organisms is not clear. The spirochaetæ are probably unimportant parasites. (5) The remarkable similarity to noma, clinically, pathologically, and bacteriologically, leads to the supposition of a close relation between it and necrotic ulcerative angina. (6) Diphtheria must be differentiated from Plaut's or Vincent's angina; the absence of diphtheria organisms is the deciding point; the two may coexist.

Paralysis of the Abdominal Muscles in Acute Anterior Poliomyelitis of Children.—J. IBRAHIM and O. HERMANN (*Deut. Ztschr. f. Nervenheilk.*, 1906, xxix, 113) call attention to the fact that paralysis of the abdominal muscles in the course of infantile spastic paralysis is almost unknown. The authors report four cases in detail, and briefly review eight similar cases. (They claim that no others have been reported.) In their own cases no doubt concerning the diagnosis existed. In three instances both lower extremities were paralyzed, in one, also the right arm; one of the patients had paralysis of the tibialis anticus muscle only, but the history clearly marked it a case of anterior poliomyelitis. In two of the patients the muscles of the back were markedly weak, one of the children could not sit up at all, the fourth showed no involvement of these structures. All four when sitting up or supported, showed characteristic paralysis of the abdominal muscles. The central muscles were not affected; portions of the lateral muscles of one side were affected in two; in the others the condition was bilateral, but even here, one side was affected more than the other. The muscles would protrude upon the slightest exertion, simulating a hernia, but closer examination would reveal the limitation of the soft tumor to the abdominal muscles. In no case was there protrusion of the abdominal viscera and reduction was easy in all of them. When supine the abdomen had a perfectly normal appearance. Pathologically, the condition is one of involvement of the spinal centres governing the oblique and transverse muscles, although no postmortem evidence of this exists. They recommend a study of the abdominal and back muscles of every case of poliomyelitis, believing that their involvement is frequently overlooked and that in postmortems on such cases special attention should be paid to that part of the cord having to do with the innervation of these muscles. The treatment of the condition is an abdominal

support; two of their patients showed considerable improvement after some years. There is nothing to be expected from an operation.

Etiology and Treatment of Congenital Inspiratory Stridor.—L. BALLIN (*Jahr. f. Kinderheilk.*, 1906, lxii, 808) includes among cases of stridor inspiratorius congenitus only those which answer to the following description: The condition must begin at birth or, at the latest, a few weeks after; at inspiration the child produces an intense noise, the point of origin of which is to be found in the larynx or below it; the noise may be produced with each inspiration or only during moments of excitement. The condition disappears toward the end of the first year, leaving no disturbance whatsoever of the general health. It never produces dyspnoea, and if this is present a complication may be assumed to exist. Some authors believe the condition to be due to abnormalities in the larynx, chiefly a bending of the epiglottis and an abnormal approximation of the arytenoepiglottic folds. Others believe it to be due to abnormal softness and yielding on the part of the infantile larynx, and the above mentioned changes to be secondary results; some speak of spasm of the glottis and of inco-ordinated breathing, resembling the stuttering of the speech; the latest theory, defended chiefly by Hochsinger, explains the condition with hypertrophy of the thymus body. Ballin has observed five cases, in two of which autopsy was performed, and two others were examined by Röntgen rays. In only one could enlargement of the thymus be noted; this condition could, therefore, be excluded. Which of the other two theories is correct could not be determined even though serial sections of the tissues were made. The larynx in both fatal cases was found to be smaller than in the cases of normal children, a point in favor of the developmental abnormality. Respiratory disturbances in such patients should be carefully guarded against and even slight disturbances energetically treated.

Pleuritic Effusion Treated with Adrenalin by the Preliminary Intraserous Injection Method.—W. EWART and F. MURRAY (*Brit. Med. Journ.*, 1906, i, 973) report the case of a boy, aged ten years, suffering with pleuritic effusion. They performed paracentesis because of orthopnoea; the siphonage method was employed, filtered air being allowed to enter by thoracic suction. Less air was introduced than fluid removed; 54 ounces of fluid were withdrawn and 477 c.c. of air admitted. The pneumothorax was well borne, but the fluid reaccumulated. In a space of ten days, five intraserous injections of 10 minims of adrenalin solution (1 to 1000) were made; it was intended eventually to perform thoracentesis, but this was not necessary as the fluid underwent complete absorption. Improvement in physical signs was noted after the second injection, and on discharge there was but slight impairment of resonance, Grocco's triangle had entirely disappeared, and the heart had returned to its normal position. The author calls attention to the harmlessness of the filtered-air pneumothorax, the respiratory advantage of the pneumothorax over the hydrothorax, as the lung was able to re-expand before the heart returned to its position, and the re-accumulation of the fluid in spite of the early production of the pneumothorax. Adrenalin thus administered is harmless if care is taken to inject it into the pleural cavity and not into the lung; re-absorption of fluid was induced by it. They advise adrenalin injections a day or two prior to the performance of paracentesis.

THERAPEUTICS.

UNDER THE CHARGE OF

REYNOLD WEBB WILCOX, M.D., LL.D.,

PROFESSOR OF MEDICINE AND THERAPEUTICS IN THE NEW YORK POST-GRADUATE MEDICAL SCHOOL AND HOSPITAL; VISITING PHYSICIAN TO ST. MARK'S HOSPITAL.

ASSISTED BY

HENRY HUBBARD PELTON, A.M., M.D.,

INSTRUCTOR IN MEDICINE IN THE NEW YORK POST-GRADUATE MEDICAL SCHOOL AND HOSPITAL;
CHIEF OF THE MEDICAL CLINIC, PRESBYTERIAN HOSPITAL DISPENSARY, NEW YORK.

The Action of Digalen.—DR. S. LIVIERATO makes, among others, the following statements concerning digalen (soluble digitoxin): Clinical and animal experiments warrant the assertion that this exercise an excellent effect upon the heart and the circulation. The drug prolongs the diastole and strengthens the systole, thus allowing a more complete filling of the ventricles and a more thorough emptying of these cavities. Digalen also renders the pulse less rapid, fuller, and more regular. It diminishes the rate of respiration and ameliorates dyspnoea. The blood pressure is raised; the increased tension persists for several days after the administration of the drug and is undoubtedly due to the increased power of the systole. In all instances these effects were noticeable within five or six hours after injection of digalen, and in many subjects within three hours. The drug is actively diuretic as a result of its effect in increasing the blood pressure; this increase in the urinary excretion persists for a number of days following the injection and makes its appearance in from twelve to twenty hours after this procedure. Digalen is especially indicated in mitral disease, and its advantages over the preparations of digitalis leaves are its ease of administration, it being quickly soluble, its rapid action, and, when given internally, its lack of unpleasant effect upon the digestive system. When given for long periods and in large doses no toxic symptoms appear, due to cumulative action. The lack of this effect appears to be due to the easy solubility of the drug.—*Wiener klinisch-therapeutische Wochenschrift*, 1905, No. 52, p. 1304.

Magnesium Sulphate in Intraspinal Injection as an Anesthetic.—DRS. HAUBOLD and MELTZER after an experience comprising seven cases conclude that the intraspinal injection of magnesium sulphate is capable of producing anesthesia and, when cautiously used, is safe. They recommend the following procedure: inject about 15 minims of a 25 per cent. solution for every eighteen to twenty pounds of body weight and wait about two hours. It is probable that by the end of this time analgesia will be sufficiently advanced to permit an operation on any part of the lower half of the body. A small dose of chloroform, however, should be administered to divert the patient's attention and to hasten and complete the anesthesia. Immediate washing of the spinal canal should always follow the operation. A further experience will show whether this method can be employed as a means for general

anesthesia for operations upon the upper half of the body.—*Journal of the American Medical Association*, 1906, No. 9, p. 647.

Stovaine.—DR. H. GERAUD summarizes the results of the observation of a number of instances of spinal anesthesia with the conclusion that stovaine possesses certain undoubted advantages, such as rapidity of action, general harmlessness, absence of pulmonary complications, of prolonged vomiting, etc. Its disadvantages are fewer than those of chloroform. The only unpleasant effects observed by the author have been certain disturbances of the sphincters and irritation of the medulla evidenced by muscular contractions. The instances of fatality reported have, however, influenced the view point and have rendered it impossible to consider spinal stovainization with a perfectly tranquil mind. It is however preferable to chloroform under certain conditions and while not perfect in every regard, offers certain advantages. The ideal method of anesthesia is still undiscovered.—*Journal de Médecine de Paris*, 1906, No. 3, p. 32.

DR. L. KUGEL reports several operations for warts, phimosis, etc., performed under stovaine, from which he concludes that in this substance we have a local anesthetic which is fully the equal of cocaine. In no instance were unpleasant after-effects noticeable, and in the patient upon whom the phimosis operation was done the anesthesia lasted twelve minutes. In each operation a 1 per cent. solution was used. Stovaine is a glistening crystalline powder, easily soluble in water, and its solution may be readily sterilized by boiling. In 10 per cent. strength it may be employed as an anesthetic in tooth extractions, here being injected into the gums. The drug has the advantages of cheapness, only slight poisonous effect and stability.—*Wiener klinisch-therapeutische Wochenschrift*, 1906, No. 7, p. 161.

Alcohol in Acute Illness.—DR. G. NEWTON PITT considers that alcohol should be administered in acute disease under the following conditions: (1) Failing circulation, indicated by rapid, feeble, dicrotic, or irregular pulse, and a feeble first sound to the heart whether appearing suddenly or gradually. (2) In feeble, exhausted, especially alcoholic subjects, also in the aged or very young. (3) Inability to take food, from failure of digestion, with a dry tongue, especially if persistent. (4) Persistent pyemic conditions with high temperature. (5) A condition of low muttering delirium with profound exhaustion and insomnia. (6) During convalescence from acute illness while the appetite is still capricious. As a stimulant the alcohol should not be diluted too much, but is best given in a little water or food. For hospital patients, simple alcohol diluted is superior to inferior spirits or wine. When old, well-matured spirits or wines rich in ethers can be obtained these are undoubtedly preferable. Champagne is often valuable when the appetite has failed during long illness or in convalescence from protracted illness, and especially in children nothing is equal to a fine old sherry. The amount of alcohol given during twenty-four hours may be from 2 to (rarely) 6 ounces in divided doses. This quantity may be exceeded in combined pericarditis, endocarditis, pleurisy, and pneumonia due to rheumatism, and in a few instances of very severe pyemia. The proper action of the drug is evidenced by an amelioration of all the symptoms. When too much is given, the

tongue becomes dry, the condition more lethargic and the odor of alcohol may be detected upon the breath.—*The Practitioner*, 1906, No. 4, p. 476.

Adrenalin in Therapeutics.—DR. O. JOSUÉ concludes a paper upon this subject as follows: Adrenalin is contraindicated in conditions of high arterial tension, when the cerebral arteries have undergone sclerotic changes, and in the presence of aneurysm. It should not be injected into the veins, into the pulmonary parenchyma, or into the trachea. Hypodermic injections up to $\frac{1}{120}$ to $\frac{1}{60}$ of a grain may be given in twenty-four hours, but if this dosage is exceeded there is danger of producing toxic effects. Doses of $\frac{1}{60}$ of a grain daily may also be given by mouth. Here the danger of poisoning is less. Applications to the unbroken nasal mucous membranes may be made without anticipation of untoward action. In whatever manner the drug is administered it is unwise to continue its use for more than six days at a time for fear of causing cardiac or arterial complications.—*La Quinzaine Therapeutique*, 1906, No. 24, p. 562.

Radiotherapy in Pruritus.—DR. DUPEYRAC considers that the Röntgen rays have a decided antipruritic action. In conditions in which the itching is due to the presence of parasites the first indication, of course, is to destroy these; but in other affections in which pruritus is the chief symptom, such as lichen, neurodermatitis, etc., the author considers that radiotherapy is indicated and reports instances of cure and improvement; three patients affected with anal pruritus were also completely cured in five or six treatments. Vulvar pruritus also responds well in some cases and the itching of eczema, psoriasis, and the seborrhœides may also be ameliorated. The author believes that the rays possess a selective action upon the sensory nerve endings in the skin.—*Marseille médical*, 1906, No. 6, p. 165.

The Treatment of Pernicious Vomiting of Pregnancy.—DR. J. W. WILLIAMS considers that the treatment of this condition should vary with type of the disorder. Assuming that medicinal treatment has been tried and exhausted and that the patient is in a serious state the first indication is to remedy any abnormality of the genital tract or ovum; retrodisplacements should be replaced and retained by a pessary, ovarian tumors removed, and inflammation treated by antiphlogistic measures. In the presence of hydramnios or vesicular mole the uterus should be emptied. In the toxemic type of vomiting abortion seems to be the only chance of saving the patient, there being no reason to trust in medicinal or dietetic treatment. After the operation abundant saline injections should be given by rectum or under the skin, and gastric lavage with weak sodium bicarbonate solution should be employed if the vomiting persists. Food and even ice should not be given by the mouth, dependence being placed upon the saline injections and rectal feeding. In the neurotic type of vomiting the treatment depends upon the impressionability of the patient. A vigorous moral lecture may suffice in some; in others, the patient should be assured that no fatal termination is to be expected nor will abortion be necessary, but the complaint will probably yield to treatment; most minute directions should be then given as to diet and a placebo should be prescribed. If this

does not suffice the patient should be put to bed under a nurse's charge and all friends and visitors excluded from the room. No food should be given by the mouth, but nutritive enemata and saline irrigations are to be substituted. Morphine hypodermically or the addition of opium to the enemata may be necessary. If no improvement is noted the patient should be threatened with removal to a hospital, and if necessary this should be followed out and a vigorous rest cure instituted. The modified rest cure, however, is usually all that is necessary and will be followed by cessation of the vomiting within a few days in most instances.—*Bulletin of the Johns Hopkins Hospital*, 1906, No. 180, p. 71.

The Influence of Antitoxic Serum upon the Tuberculo-opsonic Index.—

DR. T. R. BRADSHAW, by a series of experiments carried out upon nine patients, has shown that it is probable that subsequent to inoculation with antidipltheritic serum there is a fall in the tuberculo-opsonic index. The depression seems to increase for some time and in one instance it persisted for months. The immediate effect in two instances was an elevation of the index. The results of this experimentation are important, for before giving an opinion upon a low opsonic index we should exclude all such influences as previous serum injections. The reason for the depression of the index can hardly be stated at present, but it is not unreasonable to assume that it is due to some property in the blood of the horse and has nothing to do with the specific antitoxins.—*The Lancet*, 1906, No. 4316, p. 1387.

Saline Injections in Cholera.—MR. F. C. McCOMBIE has employed the following treatment in one hundred and five patients suffering from Asiatic cholera, with twenty-five deaths: Upon admission the patient receives a hypodermic injection of $\frac{1}{6}$ to $\frac{1}{4}$ of a grain of morphine, followed by 20 minims of spirit of ether (B. P.) every four hours, and by digitalin if there is sufficient heart weakness. By mouth, 10 grains each of calomel and sodium bicarbonate are given and the following mixture is administered every three hours: carbolic acid, 2 minims; sodium bicarbonate, 10 grains; bismuth carbonate, 10 grains; aromatic spirit of ammonia, 15 minims; spirit of chloroform, 10 minims; and peppermint water to one ounce. Hot-water bottles and friction are applied to the extremities and the patient is allowed to drink freely of water containing 20 minims of sulphuric acid to the pint. If signs of reaction do not appear salt solution (60 grains to 1 pint of boiled water) at a temperature of 105° to 110° F. is injected into the subcutaneous tissue of the breasts, axillae and epigastrium. There is no difficulty in the absorption of even as large a quantity as 9 pints. The injection is continued until the pulse shows improvement, and at any sign of failure it is recommenced. The author considers that the treatment is more effectual if 10 minims of a 1 to 1000 adrenalin solution per pint are added to the saline solution.—*The Lancet*, 1906, No. 4317, p. 1468.

Coagulated Milk in Gastric and Pancreatic New-growths.—DR. A. MARTINER has found that coagulated milk was most excellently borne by a patient suffering from a new-growth involving the stomach and pancreas. A diet consisting of milk and starches caused marked pain

and emesis, which ceased at once upon changing the regimen to one comprised principally of two quarts of coagulated milk per day. Milk in this form caused no fermentation in the digestive tract and no pain followed its ingestion; the patient became so much improved that an exploratory operation was undertaken, with the result of confirming the diagnosis.—*La Presse médicale*, 1906, No. 18, p. 140.

Camphorated Phenol in Acute Suppuration.—DR. C. EHRLICH employs the formula suggested by Chlinsky, which consists of phenol 30 parts, camphor 60 parts, alcohol 10 parts. This mixture is used as a wet dressing and abscesses are packed with gauze impregnated with it. In acute inflammation the symptoms are relieved in a few hours by this treatment and if suppuration has taken place it remains localized at its original focus, consequently small incisions suffice when drainage becomes necessary. The technique of treatment consists in enveloping the affected area in gauze moistened in the solution, covering this with sterile cotton, and applying a bandage. Often one such dressing will cause a disappearance of the inflammatory redness and swelling; incision is not necessary unless the presence of pus, as indicated by fluctuation, is evident; long incisions into the tendon sheaths are not essential in phlegmonous infections of these structures, and all infected wounds respond rapidly to this form of treatment. The pain is quickly relieved and there are no untoward effects whatever. Ehrlich has employed the camphorated phenol in paronychia, phlegmonous conditions, leg ulcers, fissure ani, tuberculous fistulas, furuncles, erysipelas, and all kinds of infected wounds.—*Münchener medizinische Wochenschrift*, 1906, No. 11, p. 491.

OBSTETRICS.

UNDER THE CHARGE OF

EDWARD P. DAVIS, A.M., M.D.,

PROFESSOR OF OBSTETRICS IN THE JEFFERSON MEDICAL COLLEGE, PHILADELPHIA, ETC.

Ectopic Gestation.—The June number of the *Journal of Obstetrics of the British Empire*, 1906, is entirely devoted to ectopic gestation. In addition to the original papers and abstracts, MILLIGAN contributes a very good review of the symptoms and diagnostic points in this condition. MacLean reports an abdominal pregnancy in which a foetus was removed six months after spurious labor at term. Marsh reports from an Indian hospital a case of abdominal pregnancy continuing to term, in which the fetus died; swelling of the abdomen disappeared and menstruation returned. She finally developed foul-smelling discharge from the rectum and a native midwife pulled out from the bowel the greater portion of the fetus. A portion of the foetal skull was delivered from the rectum after her admission to the hospital. On examination this was found to be the occipital and the two parietal bones. This occurred twenty-seven months after pregnancy began. The patient made a tedious recovery.

Phillips reports a case of tubal mole with abortion. During the process of abortion, as the tubes in this patient were diseased, the body of the uterus and both tubes were removed. The patient making a good recovery.

Berkeley and Bonney report the intramural rupture of a tubal gestation sac. The tube was distended, the sac of the embryo had burst, but there was no blood or peritonitis in the pelvis.

Doran reports a case of cornual gestation with rupture, treated successfully by operation. Subsequently, pregnancy developed in the other cornua of the uterus.

Andrews contributes a review of work done in this subject during the last four years. The remainder of the issue of the journal is occupied with abstracts of current literature. This number forms a most interesting and valuable contribution to the literature of the subject.

Uterine Contraction without Retraction in Highly Nervous Patients.—

HERMAN (*British Medical Journal*, June 16, 1906) reports the case of a patient with premature labor, in which the child was small, the passage fully dilated, and the pelvis of ample size. Labor was arrested for more than twenty-four hours and delivery was followed by high temperature lasting more than two weeks without physical signs of disease. It was considered entirely of nervous origin. The placenta was delivered by hand, but there were no signs or symptoms of sepsis.

Congenital Umbilical Hernia.—TWEEDY (*Jour. Obstet. Brit. Empire*, August, 1906) reports the case of an infant, born of deaf and dumb parents, who had a congenital umbilical hernia. The intestines protruded in a large mass covered only by a thin coating, and with a greatly distended umbilical cord. Abdominal section was performed three hours after birth and the intestines found so firmly adherent to the sac that a somewhat severe tear of the bowel occurred during their separation. This was stitched in the usual manner and the intestines replaced with considerable difficulty. The child left the hospital well, one month after operation.

Carcinoma of the Sigmoid Flexure of the Colon Complicating Pregnancy.—

CONNELL (*Jour. Obstet. Brit. Empire*, August, 1906) reports the case of a woman, aged thirty-nine years, complaining of pain in the stomach and vomiting. She had had ten children, and had usually been strong. The abdomen was greatly distended, with a tender area in the left iliac fossa; a tumor was found to the left of the uterus. On opening the abdomen the sigmoid flexure was slightly tied down to the extremity of the left Fallopian tube, but was easily separated. The intestine was clamped and divided, and it was necessary to lessen the lumen of the proximal end before uniting the bowel. The patient made a good recovery. On examining the specimen the bowel was almost entirely closed by cell elements of the growth. The growth was sharply defined and was a columnar carcinoma. At the time of operation the patient was four and one-half months pregnant, and her vomiting had been assigned to that cause.

Three Cases of Ruptured Uterus Treated by Abdominal Section and Suture. CRIPPS (*Brit. Med. Jour.*, June 2, 1906) reports three cases of

uterine rupture treated by abdominal section and suture. The first was a case of placenta prævia, the patient being exsanguinated and in collapse. A large rent was found in the uterine wall at the right lateral margin, including the entire length of the cervix and passing into the lower uterine segment. There had also been hemorrhage into the abdomen. The uterus was closed by suture and hot water, and was introduced into the abdominal cavity. The patient died in collapse before removal from the table. At autopsy, fatty degeneration of the liver, heart, and uterine muscles was found.

The second case was that of a multipara who was taken during labor with breech presentation, with severe pain in the abdomen, and hemorrhage. The uterine contents were delivered, whereupon coils of intestines, were found prolapsed in the vagina. On operation a tear four inches in length was found extending across the posterior uterine wall and into the right broad ligament. The torn tissues were brought together by suture, a drainage tube placed in the uterine cavity through the vagina, and the abdomen closed without drainage. The patient made an uninterrupted recovery. On examination the pelvis was found to be normal.

The third case was that of a multipara who collapsed during labor with severe pain; the head was on the perineum and was easily delivered by forceps; the child was dead and intestines were found in the vagina. On admission to hospital the placenta had not been delivered and the external os was rigid. Under chloroform the os was dilated, the hand passing into the uterus, which was found empty and well contracted; there was a large tear on its anterior surface on the right side. The placenta had been expelled through the tear into the abdominal cavity; it was readily delivered by hand, and the uterine cavity and rent were packed with gauze. Later abdominal section was performed and the tear brought accurately together. The patient made a good recovery.

Repeated Ectopic Pregnancy on the Same Side.—GOODALL (*Brit. Med. Jour.*, June 2, 1906) reports the case of a primipara who had an ectopic tubal gestation on the right side. The tumor could be clearly made out and symptoms of rupture were present. The patient was not treated by operation; the tumor gradually disappeared and the patient recovered. Later the same condition again developed on the right side. This again disappeared, with a discharge of decidua, without operation. The patient gradually recovered completely and menstruation returned. The use of the ice-bag on both occasions seemed to be sufficient to check the growth of the tumor and completely to relieve the patient's pain.

Puerperal Sepsis Due to Diplococcus Pneumoniæ.—SMITH and SPRIGGS (*Brit. Med. Jour.*, June 2, 1906) report the case of a multipara who, after spontaneous parturition, had fever with crepitation at the base of the left lung. Fever with vomiting and diarrhœa continued, with the development of pulmonary signs on both sides. The patient became delirious and died with falling temperature. On autopsy the peritoneum and uterus showed no signs of inflammation; there was œdema only at the bases of the lungs. During the patient's illness blood was taken from the patient for examination, and at the moment of death blood was also taken from the heart. Cultures were also made from

the pericardial fluid and heart blood; all of these showed the presence of diplococcus of pneumonia. Animals injected with the cultures died with pneumonia.

Etiology and Treatment of Eclampsia in the Puerperal Period.—IÆP-MANN (*Zentralb. f. Gynäkologie*, No. 24, 1906) believes that eclampsia after labor is caused by toxins formed during pregnancy and retained but not neutralized in the liver. He reports two cases which were in a desperate condition and in which it was necessary to employ artificial respiration. In both of these cases the patients recovered under the most vigorous stimulation with remedies addressed to stimulating also the excretory organs.

Pyelonephritis Complicating Pregnancy.—ZICKEL (*Monatschr. f. Geb. u. Gyn.*, Band xxiii, Heft 6, 1906) reports the case of a multipara, eight months pregnant, admitted to hospital for confinement in apparently good condition. She had a purulent infection of one eye, the secretion showing the presence of staphylococci and streptococci. She was suddenly taken with chill and fever, which were repeated and which ushered in the spontaneous birth of a living child; chills and fever continued without signs and symptoms of infection of the genital organs. The urine was acid, and contained pus abundantly, with casts and kidney epithelium. The right kidney was markedly dislocated downward and somewhat enlarged. As the patient's tissues were thin the kidney could be palpated and was found to be distinctly tender over its pelvis and lower portion. Examination of the left kidney was negative. The bladder was not sensitive nor was there any disturbance of the urinary passages. Under a milk diet and nrotropin the patient steadily improved. The urine gradually cleared up and the patient made an apparently good recovery.

The Physiological Action of Hydrastis and Ergotin on the Uterus and Organs of Circulation.—FELLNER (*Archiv. f. Gyn.*, Band lxxviii, Heft 3, 1906) from experiments to determine the action of hydrastis and ergotin, concludes that upon the uterine muscle the action of these drugs is independent of their action upon the vascular system. Ergot produces contractions of the uterus of tetanic character. There is an appreciable difference between the action of hydrastis and of ergot, as hydrastis does not produce tetanic contractions of the uterine muscle. Animals respond promptly to ergotin and hydrastis in hypodermic doses, if good preparations be used. Sphacelin acid proved a very dangerous drug and one especially likely to produce gangrene in large doses. Hydrastis seems to act upon the nerve centres, controlling the vasomotor fibers. To some extent also it influences the filaments in the walls of the vessels, and the peripheral ganglia also. Ergotin seems to produce almost the same effect upon the blood pressure and pulse. It is suggested that to stimulate uterine contractions, hydrastis and ergotin be employed together. In this manner it is hoped to avoid the greatly increased intrauterine tension caused by ergot, and also the tetanic character without relaxation of the uterine contractions following the administration of ergot.

GYNECOLOGY.

UNDER THE CHARGE OF

HENRY C. COE, M.D.,
OF NEW YORK.

Cystic Degeneration of the Ovaries following Operation on the Adnexa.—VANTRIN (*Annales de Gynecologie et d'Obstetrique*, No. 2, 1906) concludes an article on this subject as follows: It is bad practice to leave an ovary or a portion of an ovary after operations within the pelvis in which masses of old exudate are encountered. Such ovaries tend to become cystic and even malignant, and are especially painful because of pressure by the surrounding exudate. Secondary operations for their removal are always difficult.

Vantrin further expresses his belief that the abdominal route, with total extirpation of the uterus and adnexa, is the ideal method of treatment in these cases.

Toxin of Fibroids during Pregnancy.—LEPAGE and MOUCHOTTE (*Annales de Gynecologie et d'Obstetrique*, No. 2, 1906) report a successful case in which the patient went to full term after myomectomy had been performed, and have collected four others from the literature, in three of which the tumor was removed, two of the women being delivered at term, while one aborted. With regard to the symptoms they admit that the diagnosis is not always clear, since the same sudden onset and abdominal pain may result from displacement of a fibroid or partial torsion of the whole uterus. Although the tumor may be ovarian instead of uterine, the presence of symptoms pointing to probable torsion of the pedicle constitutes a sufficient indication for operation.

Retrovesical Myoma.—BRETSCHNEIDER (*Zentralblatt f. Gynäkologie*, No. 23, 1906) reports a successful case and refers to the literature, especially to papers by Schanta and Hofmeier, who consider that the operation in such cases is difficult and dangerous, the mortality being 10 per cent. The main point is to avoid injury to the bladder and ureters and to provide good drainage for the large denuded area.

Vaginal enucleation is only practicable in the case of small tumors. Vaginal hysterectomy meets all the indications, but is recommended by Schanta only in the case of tumors not exceeding an apple in size. Larger growths should be removed by the abdominal route, total extirpation of the uterus being advised in order to provide better drainage, although great care is necessary in order to avoid immediate injury to the bladder and ureters or secondary necrosis from the extensive denudation. The treatment of a retrovesical tumor after enucleation requires careful attention.

Operation for Ventral Hernia.—GRASER (*Zentralblatt f. Gynäkologie*, No. 25, 1906) describes the following method of dealing with large umbilical and ventral hernia: A transverse incision is made through the

skin above the upper limb of the hernia. The sac is opened, intestinal adhesions are separated, and omentum resected if necessary. The layers of the rectus sheath are dissected out, transverse incisions in the anterior layer being made, and the flaps laid back by blunt dissection. The rectus muscle and fascia are sutured separately, the peritoneum and posterior layers of fascia being united vertically with the same suture, next the muscles. The anterior layer is then sutured transversely, then the fatty tissue, and finally the skin. Drainage is rarely necessary.

Rare Neoplasms of the Female Urethra.—THOMSON (*Zentralblatt f. Gynäkologie*, No. 25, 1906) reports a case of fibroma of the urethra and refers to twenty-one cases collected by Salen and twenty-seven by Lomberg. Fifty cases of urethral cancer have been reported. Thomson, in describing a case of sarcoma in this region, states that Leitz could find reports of only thirty-three cases of primary sarcoma of the urethra.

Syphilis of the Adnexa.—PIEHEIM (*Gaz. des hôpitaux; Zentralblatt f. Gynäkologie*, No. 26, 1906) calls attention to the fact that the diagnosis of syphilitic oöphoritis has usually been based entirely on the result of antisppecific treatment; metrorrhagia is the only symptom, if there is any. The disease is rare. Still more infrequent is syphilitic salpingitis unaccompanied by similar infection of the ovaries. The only anatomical change is marked thickening of the tubes.

OPHTHALMOLOGY.

UNDER THE CHARGE OF

EDWARD JACKSON A.M., M.D.,
OF DENVER, COLORADO,

AND

T. B. SCHNEIDEMAN, A.M., M.D.,

PROFESSOR OF DISEASES OF THE EYE IN THE PHILADELPHIA POLYCLINIC.

The Sight of Sharpshooters.—GINNESTOUS and COULLAUD (*Arch d'Ophthalm.*, May, 1906), from an extensive study of visual conditions that come into play in the act of aiming firearms, come to the following conclusions: (1) Aiming is an act of monocular vision. (2) Accuracy of aim is compatible with considerable diminution, and even with complete abolition, of the sight of one eye; as it is also with monocular ametropia. This is proved by the successful contestants in shooting-matches, who have but a single eye or are affected with amblyopia, exanopsia, or anisometropia. (3) Aim is usually taken with the eye whose visual acuity is best. (Tscherning's and Vallee's *Theory of the Governing Eye*.) In the majority of cases it will be found that gunners that aim with the left eye have defective vision or consid-

erable refractive error in the right. Those that shoot with both eyes open have usually monocular amblyopia, thus doing away with the necessity for shutting the other eye. Both these classes of individuals may become excellent shots. (4) The acuity of the better eye (the aiming eye) should not be less than half the minimum; in certain exceptional cases, however, the acuity may fall below this limit. (5) The static refraction is of little importance for accuracy of aim; the accommodation, however, must be adequate; for the sight upon the barrel must be accurately seen. The sight is situated from three-quarters to one and a quarter meters from the eye. (6) Hence, myopia above 1 D. should be corrected, as well as hyperopia (leading to accommodative asthenopia) and presbyopia. (7) Military rules should permit the soldier to aim with either eye (to shoot from either shoulder) and to close or keep open at pleasure the other eye. A minimum visual acuity of one-half should be required in one eye while that of the other may be neglected.

The Color of the Macula Centralis Retinæ.—GULLSTRAND (*Græfe's Arch. f. Ophthalm.*, 1906, lxxii, 1) denominates the unique spot of the retina characterized entoptically and anatomically by absence of vessels, as well as of rods and visual purple, the macula centralis retinæ. He regards the macula lutea as a postmortem phenomenon. Ophthalmoscopic examination by daylight, and even in strongly pigmented eyes the retinas of which showed a grayish reflex, and in recent cases of acute ischemia of the retina, did not show a trace of yellow. Examination with the mercurial arc light, with which the yellow color in question would become visible, if present, likewise gave a negative result. Anatomical researches showed that the color of the macula is the much more pronounced, the greater the force used in separating the retina; while the color is entirely absent if this separation is effected without any violence.

Congenital Atrophy of the Optic Nerve.—KOWALEWSKI (*Centr. f. prak. Augenh.*, April 1, 1906) writes concerning this rare condition, which was first described by Leber in 1871. Since then, forty papers relating to fifty families have appeared. The disease begins suddenly, with reduction of the visual acuity to counting fingers from one to four meters. Both eyes are constantly affected at an interval of a few days to a year and a half. The fundus is at first normal, or a mild optic neuritis may be present; but at the end of several weeks the papilla becomes pale, especially at its temporal quadrant (papillomacular bundle); and finally, it takes on the typical appearance of optic atrophy. The visual field is characteristic. An absolute or relative scotoma is the rule. The field is of the normal extent, or but slightly contracted. The color sense is frequently preserved, even at the periphery. The disease usually begins several years after puberty (at about the age of twenty). The course is not uniform. The visual acuity and the central scotoma generally remain stationary, but improvement has been noted in one-third of the cases; while, on the other hand, complete blindness may occur. The course of the disease is usually the same in the same family. Severe disturbances affecting the cerebrospinal system, such as epilepsy and psychoses, are very rare; slighter affections, such as migraine, vertigo, and palpitation of the heart, are frequent. Inherit

ance takes place through the mothers to the male children, and the latter may beget healthy offspring. As regards the etiology and nature of the disease, in the absence of postmortem examinations, we are entirely in the dark. Among the hypotheses set up to account for the disease, the assumption of abnormal conditions of development affecting the bones bounding the canalis opticus, and that of a degeneration of the papillomacular bundle in consequence of excessive function in neuropathically disposed individuals, deserve consideration. Treatment promises little; inunctions, potassium iodide, injections of strychnine, and galvanization of the sympathetic have been tried.

DISEASES OF THE LARYNX AND CONTIGUOUS STRUCTURES.

UNDER THE CHARGE OF

J. SOLIS-COHEN, M.D.,
OF PHILADELPHIA.

Hemorrhage following the Removal of the Pharyngeal Tonsil.—DUPUY (*The Laryngoscope*, January, 1906) collates eleven cases fatal of post-operative hemorrhage following the removal of the pharyngeal tonsil, only some of which were hemophilic. In hemophilic subjects Dupuy recommends the administration of calcium chloride for two or three days before the operation, and the topical use of sprays of hydrogen peroxide or adrenalin solution in full strength when the bleeding occurs.

Sudden Death from Papilloma of the Larynx.—FISHER (*Jour. Laryngol., Rhinol. and Otol.*, April, 1906) reports the sudden death, without premonitory symptoms, of a boy ten years of age, who appeared to choke while eating his dinner. He had always enjoyed good health and had never required medical advice, his mother stating that she had occasionally noticed a slight hoarseness, but it was never sufficiently marked to call for special advice. He had never been troubled with shortness of breath or with any choking sensations, and he had been able to run about and play with other boys.

On postmortem examination the upper aperture of the larynx was found to be almost completely occluded by a papillomatous tumor attached to the left vocal band.

The case is mentioned as one of great interest, not only clinically, but also from a medico-legal aspect, it being difficult to realize how the child had remained free from any symptom calling for medical advice.

Differential Diagnosis Between Excrescences in the Interarytenoid Space.—HORNE (*Jour. Laryngol., Rhinol. and Otol.*, January, 1906), after macroscopic and microscopic studies of tuberculous and non-tuberculous excrescences, points out that in the simple variety (pachydermia verrucosa simplex) the excrescence is an exaggeration

of pre-existing parts, so that the natural central furrow in the interarytenoid region is maintained in the growth, which is a symmetrical one occupying the centre of the interarytenoid space. In the tuberculosis variety (*pachydermia verrucosa tuberculosa*) the growth does not occupy a central position; it is usually developed more on one side of the space, and the central furrow is lost.

Primitive Carcinoma of the Trachea.—HOFFMANN (*Archives Internationales de Lar., d'Otol., de Rhinologie*, September-October, 1905) reports a case of circumscribed primitive carcinoma of the trachea in a man forty-nine years of age. An attempt was made to perform inferior tracheotomy under general anesthesia, with the view of incising the trachea afterward and removing the growth by this external access. Upon making the cutaneous incision there was sudden cyanosis, and death ensued by suffocation despite artificial respiration, injections of camphor, applications of the induced current, and massage of the heart. A report of the case and record of the autopsy is followed by a summary of the few cases of cancer of the trachea.

Removal of Thymus Gland for Compression of the Trachea.—EHRHARDT (*Archives f. klin. Chirurgie; Jour. Amer. Med. Assoc.*, May 19, 1906) removed the enlarged thymus from a girl two years of age, freeing the child at once from her suffocating condition. He left the incision open to note whether the flattened trachea would resume its normal contour, which it did spontaneously. The child has not apparently suffered any inconvenience from the operation, and has been entirely well since.

Secondary Sarcoma of the Tonsils.—JULES BREVKART and LEON LAROCY (*Annales des Maladies de l'oreille, du larynx, du nez, et du pharynx*, Mars, 1906) report a case of lymphosarcoma of the tonsil, consecutive to a latent sarcoma of the stomach, which had progressed without symptoms. They assert that none of the great classic treatises on diseases of the pharynx makes mention of the existence of secondary sarcomas of the tonsil. The patient, a man, aged eighty-three years, without pathological antecedents, applied for treatment for some trouble in deglutition and respiration, due to a painless tumor of the left tonsil accompanied with extensive submaxillary, cervical, and supraclavicular ganglionic engorgements. Death occurred from cachexia at the end of a month. The autopsy revealed the primitive tumor of the stomach.

Caseous Coryza.—DUVERGER (*Revue hebdomadaire de laryngologie, d'otologie, et de rhinologie*, June 2, 1906) describes a variety of caseous rhinitis due to aspergillus and reports a case, with illustrations of the mycelium.

The Use of Paraffin in Ozena.—BRINDEL (*Revue hebdomadaire de laryngologie, d'otologie et de rhinologie*, June 9, 1906), relying upon the results of his four years' experience with more than one hundred and fifty subjects, expresses preference for the liquid (as compared with solid) paraffin in nasal prosthesis, because it is better diffused under the submucous tissues, does not produce too great pressure at any one point, and has not the inconvenience of spontaneous elimination in block, such as he has observed in a certain number of cases in which he had injected solid paraffin.

PATHOLOGY AND BACTERIOLOGY.

UNDER THE CHARGE OF

WARFIELD T. LONGCOPE, M.D.,

DIRECTOR OF THE AYER CLINICAL LABORATORY, PENNSYLVANIA HOSPITAL.

ASSISTED BY

G. CANBY ROBINSON, M.D.

RESIDENT PATHOLOGIST, PENNSYLVANIA HOSPITAL, PHILADELPHIA.

A Contribution to the Study of Immunity against Tuberculous Infection.—METALNIKOFF (*Cent. f. Bakt. und Parasitk.*, 1906, Bd. xxxxi, p. 391), in former studies upon tuberculosis of the bee-moth or wax-moth, has shown that this insect possesses a distinct immunity against tuberculosis of man, cattle, and birds. Since the caterpillar of the bee-moth feeds upon the wax of the bee-hive, it was thought that the explanation for this immunity was to be found in the fact that the waxy capsule of the tubercle bacillus was dissolved in the body of the caterpillar. It was found, however, that against the bacillus of fish tuberculosis the caterpillar exhibited no immunity. If the infection was rapidly fatal the leukocytes of the caterpillar contained practically no bacilli, but when slightly virulent strains were employed, phagocytosis was much more marked, and dead bacilli were rapidly made way with. This important property of the bee-moth caterpillar to dissolve the waxy capsule of the tubercle bacillus was tested still further by injecting an emulsion of the wax recovered from the tubercle bacillus into the insect. Two to three hours after the injection large cells were seen in the body cavity containing wax, while after one to two days the wax had been entirely dissolved. Basing a theory of immunity upon these observations, Metalnikoff treated a small series of guinea-pigs, which had been given fatal doses of an emulsion of tubercle bacilli, with a preparation of the bodies of the bee-moth caterpillar, and found that by this means he could produce a definite passive immunity in the animals. But the difficulties encountered in the preparation of this protective extract led him to attempt the production of an anti-substance by the injection of the wax of tubercle bacilli into animals. With this serum he has been able, so far, to prolong the life of two tuberculous guinea-pigs for several weeks over the controls.

The Retention of Tubercle Bacilli at the Portal of Entry of Infection.—BAUMGARTEN (*Verhandl. d. Dent. Path. Gesell.*, 1905, *Cent. f. allg. Path. und path. Anat.*, 1906, Bd. xvi, *Ergänzungsheft*, p. 5), contrary to certain recent investigators, has found in his experiments that tubercle bacilli do not enter the body without producing a lesion at the point of infection. Animals fed with milk containing tubercle bacilli always developed an intestinal tuberculosis together with the general infection. He noticed that if the infection was rapidly fatal the lesions in the intestines, which were confined almost exclusively to the lymphoid tissue, were exceedingly small, though widespread and only to be demonstrated in sections; while the tuberculosis of the

mesenteric lymph nodes was much more advanced and appeared to be of longer duration. When the animals lived, however, for a few weeks then autopsy showed the most widespread tuberculosis of the intestinal tract. He explains this by assuming that the tubercle bacilli, though widely spread through the intestinal wall, do not occur in any one place in great numbers, while in the lymph nodes they are concentrated into a small space and here, on account of their greater numbers, produce in the same length of time, a more extensive lesion than in the intestinal wall. As in feeding tuberculosis, so in infection by aspiration, he could not discover that lesions developed in the bronchial lymph nodes without tuberculosis of the trachea or lungs. He, therefore, concludes that tubercle bacilli do not gain entrance to the lymphatics or blood stream without producing a lesion at the site of primary infection.

Lymphomatosis of the Salivary and Lacrymal Glands.—MINELLI (*Virchow's Arch.*, 1906, Band clxxxv, p. 117) describes a bilateral tumor of the parotid gland, of lymphomatous character. The growth occurred in a woman aged twenty-eight years. Similar growths have been described by several observers in both the salivary and the lacrymal glands. The growth was composed principally of lymphoid tissue, which the author believes arose from small lymph follicles that are known to exist normally in the parotid gland. By the growth of these follicles, many of which had proliferating germinal centres, the parotid tissue was compressed, atrophied, and destroyed. During this process, the cells of the gland acini tend to form giant cells that might be seen about the periphery of the growth. In Minelli's case eosinophilic leukocytes were present in great number in the boundary zone. Finally, the lymphoid tissue is replaced by a growth of connective tissue. Minelli discusses the possible relationship between these tumors and the lymphomas of pseudoleukemia. Among thirty published cases two are reported in which there was a general pseudoleukemia.

Degeneration of the Liver following Necrosis of the Pancreas.—RUDOLPH (*Deut. Arch. f. klin. Med.*, 1906, Bd. lxxxvii, p. 1), one of Hoppe-Seyler's students, reports an interesting type of degeneration of the liver found in association with necrosis of the pancreas. The patient was a woman, aged forty years, who had suffered for some time with chronic endocarditis. Late in her illness she developed jaundice, and the liver, which before had been large and hard, became softer and smaller. Bile was present in the stools. The urine did not contain sugar, acetone, leucin, or tyrosin. At autopsy the liver was congested, but showed besides small yellow areas and was jaundiced; the pancreas macroscopically appeared normal. Autolysis of the liver, as tested by allowing small pieces to digest under toluol in the thermostat, progressed very rapidly. Microscopic examination of the liver showed, besides a typical chronic congestion, areas of necrosis which were arranged about the peripheries of the lobules. In these areas the liver cells were completely destroyed, though the contour was often retained. The cells were laden with bile pigment. Most of the necroses were absolutely free from any inflammatory reaction, though a few showed leukocytes heaped up about the periphery. Microscopic studies of the pancreas revealed great numbers of necroses which were of much the same

character as those in the liver, except that the process seemed older, for about them there was intense leukocytic infiltration and new connective-tissue formation. The similarity of the lesions in the two organs suggested at once that they were in some way connected. Those in the pancreas were older, and it is Rudolph's belief that the liver necroses developed only shortly before death.

Müller has described in connection with pancreas necroses fat cells in the vessels of the liver, which he thinks may have been carried by the blood from the necrosis in the pancreas. Marx and Wiesel have reported cases similar to the one of Müller, and have discovered in the vessels of the liver fat cells, the presence of which they explain in the same way as Müller.

Rudolph adopts this same view to account for the liver lesions in his case. He thinks that they are due to a destruction of the liver cells caused by toxic substances, which are swept to the liver by the blood stream from the necroses in the pancreas.

A Study of Various Changes that Occur in the Tissues in Acute Diphtheritic Toxemia, More Especially in Reference to Acute Cardiac Failure.—DUDGEON (*Brain*, 1906, Part cxiv, p. 227) has found that one of the most striking and constant histological changes in the organs of patients dying of acute diphtheritic toxemia is an extensive fatty degeneration of the muscle of the heart and the diaphragm. These changes were found both in human cases and in animals killed by doses of diphtheria toxin. The fatty change in the muscles of the heart and diaphragm is rarely detected macroscopically, but microscopically is visible as fine medium-sized or coarse droplets, filling the cells. The fatty degeneration is best, and is often only demonstrated by staining the tissue with Scharlach R. In the diaphragm the fatty change appears very early, in experimental animals after four to six hours. In the heart, the first fatty change was noted on the fourth day. Fatty changes may also occur in other organs, but are not seen in the skeletal muscles. In the acute toxemias, no changes could be found in the phrenic and vagus nerves or in the cells of the brain. Dudgeon considers that this fatty change of the heart-muscle is the cause of the cardiac failure in diphtheria, which is independent of lesions of the nervous system.

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DR. A. O. J. KELLY, 1911 Pine Street, Philadelphia, U. S. A.

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SPECIAL ARTICLE.

THE DIAGNOSIS OF RENAL AND URETERAL CALCULI.

By J. WESLEY BOVEE, M.D.,

PROFESSOR OF GYNECOLOGY IN THE GEORGE WASHINGTON UNIVERSITY, WASHINGTON, D. C.

STONE in the kidney and ureter is a dangerous and painful malady. Tenney¹ says in 3807 autopsies in the Boston City Hospital, stone in either the kidney or ureter was found 21 times, and gallstones 146 times. During the same period he found there had been admitted to the hospital wards 109 cases of kidney or ureteral calculus and 489 cases of gallstones. These data show that the proportion (1 to 7) of urinary calculi that were not troublesome was very small as compared with gallstones, while in the patients admitted for these conditions the proportion was one to four and a half.

There are perhaps few questions of greater perplexity than the differential diagnosis of several pathological or abnormal conditions of the kidney and ureter and adjacent structures. Of these conditions probably none furnishes more difficulty than renal and ureteral calculus, though a few radiographers state that all doubt is swept away by the Röntgen rays. Whether this enthusiastic declaration is beyond question has not been determined by the large army of surgeons who have especially studied the subject of calculi of the urinary tract. Surely the time has not been reached when a careful analysis of the protean symptoms and previous history of these conditions seems superfluous. The careful study of cases of calculi in these structures will always be deemed of great importance if we can rely upon the painstaking and systematic urinary surgeon. That

¹ Boston Med. and Surg. Jour., 1902, clii, 660.

such study is conclusive and satisfactory in all cases is controverted by the many recorded failures to find calculi by operative exploration.

SYMPTOMS. We may recognize three groups of symptoms, two of which may be called representative of acute attacks, and the third of a chronic condition. In the first one, the patient may be suddenly seized with intense pain in the region of the kidney or ureter that doubles him over or causes him to fall. If in bed at the beginning he feels unable to arise; vomiting soon supervenes, frequent micturition with a deficient amount of urine is noted, and delirium may rapidly occur. The pain, if the stone be in the ureter, may radiate into the bladder, urethra, testicle, or labium. Sometimes it is reflected even to the heel. Retraction of the testicle is more readily noticed in childhood owing to the tonicity of the cremaster muscle and the little weight of the testicle. In spite of prodigious doses of morphine the suffering is intense and remains so for from two to fifty hours. Involuntary discharge of feces and urine often occur. A few hours after the inception of the attack blood is discovered in the urine; it may continue for a few days. For a short time, too, following subsidence of the pain, a localized soreness is manifest.

In a second class of acute or recurrent cases the patient has frequent attacks of renal crises that are not so severe and seem to be expected by him. They usually occur after some vigorous exercise, such as playing tennis or running. At first there is a feeling of discomfort and then of localized pain in the affected side; vomiting, fainting, and loss of sphincteral control follow, and great prostration occurs. The pain may extend, in ureteral cases, to the corresponding side of the bladder. The quantity of urine is decreased during the attack, but increases subsequently. It may be normal in composition. A tumor in the region of the kidney may appear, though this is less common when the stone is in the kidney. The attack may last but a short time and recur at short intervals.

In the third or chronic class there is usually a history of neglected urinary calculus, though now there is only vague pain always localized in the urinary tract. It may radiate to the thigh, leg, or abdomen. The patient is not confined to bed, but has constant discomfort; variations in the quantity of urine are less marked, and even retention may occur. This class is most likely to be associated with infection, and the symptoms are correspondingly modified. The patient has a peculiarity in gait that indicates a desire to keep the psoas muscle relaxed. He sleeps on the affected side, and the pain may be greatest on the opposite side. Blood in the urine may be present, but not usually.

It is unfortunate that no positive symptom, other than the passage of the calculus, is known. Could reliance be placed upon the combination of any two or even three symptoms great assistance would be afforded the surgeon in very many instances. Indeed, many times

a stone in the kidney or ureter has reached a large size without attracting in any way the attention of the patient. This has been ascertained by autopsy and by an attack of renal colic being promptly followed by nephrolithotomy or ureterolithotomy, by which the character of the stone was ascertained.

The principal symptoms of renal or ureteral calculus are pain, hematuria, urinary changes (both in quantity and quality), and frequent urination. Beside these, various others are oftentimes present and quite as often increase as lessen the difficulty of differentiation. Of these may be mentioned the presence of a mass in the region usually occupied by the kidney—which may be a kidney much disturbed by calculi, hydronephrosis, or pyonephrosis. Fever, a chill, a history of previous attacks, the presence of a stone in the bladder, or the history of the passage of one or more of stones, or of sand, are commonly met with. These are of great assistance in diagnosis.

Pain is a symptom very variable. It depends largely upon the location of the stone in the kidney and its mobility. If in the parenchymatous or cortical portions pain, if present, is not prominent. If in the pelvis the pain becomes intense, in fact, produces what is said to be the most severe pain known. If it completely obstructs the outlet of the pelvis of the kidney acute hydronephrosis occurs, and this increases the pain. It is more than probable that the pain in renal colic is distinctly local, though the reno-renal reflex is often observed in the fellow kidney. It is of the sharp, lancinating variety and is said to radiate downward along the urinary tract, or down the thigh by way of the gluteal muscles. Sometimes the radiation is toward the umbilicus. I am confident, however, and my experience is largely the basis of this opinion, that such radiations are due to ureteral involvement. If the obstruction is not complete chronic hydronephrosis results and the pain is more constant and less severe. It may be entirely absent except by causing trouble in neighboring structures from the encroachment incident to the large size of the mass. Even when anuria has resulted from permanent obstruction by a calculus, pain may entirely subside and the calculus remain quiescent for years. Instances of marked renal atrophy resulting from calculous anuria are not wanting in the literature of this subject. In frequent slight attacks of renal colic the pain arises markedly. The size of the calculus seems to have no relation to the degree of pain; the composition of the calculus, however, does seem to have such influence, the oxalate or mulberry stones appearing to cause the worst attacks, and the uric acid stones the least severe.

Hematuria is an important symptom, since rarely does a calculus become restless without causing hemorrhage. It may vary from a few blood cells discoverable microscopically in the urine to a quantity sufficient to alarm the patient and the surgeon. Death from calculous hematuria has occurred. When associated with other symptoms of renal calculus bloody urine is of marked signi-

fiance; alone it is of much less importance. Slight increase in blood pressure and enfeebled capillary walls lead to slight kidney hemorrhage. It is very common in papilloma and other neoplasms of various portions of the urinary tract. In tuberculosis it is a fairly common symptom. It is a usual symptom of traumatism of the kidney or bladder. In calculus it may be absent or it may be the only symptom; Cunningham¹ found it in 22 of his 48 cases. It may be said, however, that when due to calculus it is increased by exercise, is most likely to accompany or quickly follow colic, and rapidly subsides when the patient is made to rest in the horizontal position. The clots are long and perhaps of irregular shape, being molded about a calculus or in the ramifications of the kidney pelvis. They may be four or five inches in length. The terminal end is usually very long and slender. They are best studied after washing through many waters so that they are transparent.

The urinary changes in calculus are not constant, but very valuable information is secured from systematic routine urine analyses. In calculus of the urinary tract the urine may be entirely normal; this is most likely to be the case with quiescent uric acid calculi, yet the urine is almost certain to contain minute fragments of the stone, pus, or an unusual amount of epithelium from the involved part. Cunningham found pus in 39 of 48 cases. After attacks of colic from stone we may expect to find blood in the urine, varying from mere traces to large clots. If the stone completely blocks a ureter urinalysis will furnish no information of the conditions in the urinary tract above the obstruction.

Frequency of micturition occurs when the stone is restless in the ureter, and the intensity of the pain corresponds to the nearness of the stone to the bladder. (A woman patient of mine had a quiescent calculus in the lower part of the ureter, more than one inch in its smallest diameter, that produced no bladder irritability nor stoppage of urine from that side.) As a rule, uncomplicated renal calculi do not produce marked vesical irritability.

The presence of a mass in the usual location of the kidney may be expected after an attack of unilateral ureteral colic, though it is by no means always present. If acute ureteral obstruction has been produced by the calculus, dilatation of the urinary tract proximal to the site of obstruction will occur, and, within certain limits, will correspond to the duration of the obstruction. It never reaches the size that results from intermittent obstruction from kinks. If pyonephrosis is marked the enlargement is greater than in acute hydro-nephrosis and the mass is less elastic.

A *chill* may result from the impress upon the nervous system from pain or from toxemia. *Fever* indicates pyonephrosis, and a leukocyte count at this time will show a varying leukocytosis. Tenney saw it rise in four hours from 12,000 to 16,000.

¹ Boston Med. and Surg. Jour., 1902, clii, 655.

The history of previous attacks of calculous colic is not always attainable. Perchance there has been none. However, as a calculus in passing through the urinary tract is very likely to find various lodgements causing colic, a strong probability exists that attacks have occurred or will occur. If to these symptoms we may be able to add the fact that a stone has been passed *per urethram* or exists in the bladder, we have a group of symptoms that justify a diagnosis of renal or ureteral calculus. That such calculi may be bilateral should be borne in mind.

In the combined tables of Cunningham and Morris¹ the right side was involved 119 times, the left 95, and both 11 times. Necessarily the 5 per cent. of bilateral cases may cause much confusion in diagnosis, unless bilateral anuria should be produced. In cases of unilateral calculous anuria, complete anuria from blocking of the fellow ureter gives the surgeon great concern as to which side should be selected for operation. Palpation may find the silent kidney atrophic and the functioning one hydronephrotic. In that event the diagnosis is established. The limits of age in which renal and ureteral calculi are found is practically twenty and forty years. Beyond forty they are not commonly found, but this cannot be said of the first twenty years of life. Cabot² found the age varied in his cases from fifteen to fifty-four years, the average being thirty years. Sex seems to have no significance, as the combined tables of Tenny, Morris, and Tuffier show it to have occurred 276 times in women and 259 times in men. Probably the surgeon who treats more women than men finds it oftener in women, and *vice versa*.

DIAGNOSIS. The various features of physical examination that are of moment are drinking large quantities of water, palpation, including rectal, intravesical, and vaginal palpation, cystoscopy, ureteral exploration with catheter, probe, or waxed tipped bougie, skiagraphy, and exploratory incision. Brewer³ and others found that making the patient drink two or three quarts of water in a few hours forced calculi into the bladder. Palpation of the kidney rarely offers much information, though crepitation of calculi has been discovered. This must be a very rare occurrence. In thin subjects palpation through the abdominal wall of the upper two-thirds of the ureter might offer some information as to the presence of a mass, but probably under the most favorable circumstances the small calculi usually found in the ureter would thus escape such detection. Rectal palpation in the male and vaginal touch in the female offer very reliable information concerning calculus in the lower third of the ureter. Dilatation of the urethra sufficient for insertion of a finger for vesical or vesicoabdominal palpation will afford information as to the extreme lower end of the ureter. The danger of

¹ Surg. Dis. of Kid. and Ureter, 1901.

² Boston Med. and Surg. Jour., 1902, clii, 658.

³ Annals Surg., 1904, li, 134.

permanent injury to the sphincter is so great that resort to it for diagnostic purposes alone should be extremely rare. The so-called Meltzer sign of increased pain by hyperextension of the thigh is noticeable in conditions other than this. The stamping test of Lucas¹ is of value in mild and doubtful cases, but I have found it severe in others.

The cystoscope is useful, as by it may be learned the condition of the vesical mucosa and the ureteral mouth, as well as whether a calculus is in the bladder. The principal value of it, however, is to ascertain whether both ureters are conveying urine and whether additional or abnormal ureteral mouths exist. Ureteral exploration is of great value, as a calculus in the ureter will nearly always be detected by it. Kelly's wax-tipped bougie will probably always show scratch marks when brought in contact with a stone in the kidney or ureter. The nephrophonotoscope of Eaton² and the phonophore of Follen Cabot,³ nearly similar instruments, may prove unerring when brought in contact with such stone; but Lilienthal⁴ mentions a failure of the latter instrument in the hands of Cabot and the subsequent successful ureterolithotomy above the pelvic brim. Obstructions from causes other than calculus are not differentiable by the ureteral catheter, but by its use, as with the segregator, the relative and absolute functional state of both kidneys may be learned. Bierhof⁵ employed it for injecting boric acid solution into the kidney, claiming that if hematuria occurred within twenty-four hours a stone was present.

Exploratory incision is not justifiable except in calculous anuria, or when operation for some other condition is done, or when skiagraphy has failed to discover a calculus in the face of a very strong presumptive symptomatology. If the abdomen be opened for another purpose, intraperitoneal palpation, a very satisfactory procedure, may practically decide the diagnosis as to the ureter. The broad ligament portion of it, however, is not accessible to such palpation. Exploration of the kidney is best made by the longitudinal incision reaching through from the convex border to the pelvis. The entire ureter as well as the kidney may be explored from it.

At the present time skiagraphy is recognized by many as the *sine qua non* in the diagnosis of urinary calculi and its popularity is constantly increasing. The cases, now numbering hundreds, in which clearly depicted calculi have appeared in skiagrams and have later been removed by the surgeon have a strong tendency to convince the most skeptical. No doubt many poorly qualified skiagraphers are looking unintelligibly for renal calculi. They will not furnish

¹ Lancet, 1903, i, 1143-1148.

² Calif. State Med. Jour., 1905, iii, 357.

³ Amer. Jour. Urol., 1905, i, 213.

⁴ Internat. Jour. Surg., 1906, xix, 69.

⁵ Med. News, October 11, 1902.

clear pictures nor will they be able to interpret them properly. They are not even well-informed concerning the literature of the subject. Were one to be guided by such results skepticism would continue, perhaps increase. Probably the most successful skiagrapher is C. L. Leonard, whose corrected statistics to February 1, 1905, stated by Tenney, are 93 cases with a positive shadow, and at operation stones were found in 87 of them, and 233 cases with negative shadows in which stones were passed subsequently or removed by operation in four instances. Hulst¹ says every kidney stone can be demonstrated by the Röntgen rays provided the technique is perfect. Rumpel claims 100 per cent. of correct skiagrams for renal calculi. Moseley² says radiography furnishes the only positive means of detecting renal or vesical calculi.

The most easily detected are those composed wholly of mineral salts, oxalate of lime, phosphates, and urates ranking in the order mentioned. Those made up wholly of organic matter photograph only with difficulty. Leonard³ claims ability to get sufficient shadow from pure uric acid calculi. Fortunately these are rare. Boggs says even minute particles of uric acid may be detected. As has been mentioned much depends on the technique of the operator and upon the proper reading of the radiogram. The plate should be large enough to photograph both kidneys, both ureters, the lower ribs, and the psoas, iliacus, and quadratus lumborum muscles. Satisfactory negatives should show the outlines of the vertebral bodies, the intervertebral spaces, the transverse and spinous processes, as well as a fine differentiation between structures. Several pictures should be made—from both the front and side. Great care is necessary also in selecting the plates that defects in them may be avoided.

No doubt errors have arisen from shadows of substances near the ureter. The cases cited by Edebohls⁴ and myself were of this character. Lilienthal mentions sesamoid bones in the internal obturator muscle, calcified lymph nodes, thick lime plates in the internal iliac artery, and foreign mineral bodies in the rectum, and Brewer mentions phleboliths as producing such conflicting shadows.

When the history of the patient has been carefully secured and analyzed and the methods of non-operative examination conducted thoroughly, if doubt remains as to the presence of calculus in the kidney or ureter, resort to radiography should be made. When carefully done it should afford the data to complete the record from which a diagnosis is to be made. It is the most reliable of all methods of examination, yet the extreme position of Leonard and a few other

¹ Amer. Med., 1904, viii, 580-1100.

² New York Med. Jour., 1903, March 7, 415.

³ Annals Surg., 1901, xxxiii, 435-442.

⁴ Trans. Amer. Gyn. Soc., 1904, xxix, 89 and 91.

very expert radiographers is not maintained by a large number of the most experienced and progressive surgeons of the age.

DIFFERENTIAL DIAGNOSIS. Of the many conditions that make the diagnosis of calculus of the ureter and kidney so uncertain mention should be made of tuberculosis of those structures, hydronephrosis (especially from kinks of the ureter), pyonephrosis, renal neoplasms, acute nephritis, broad ligament tumors, ectopic pregnancy, fused kidney, double ureter, hepatic disease, appendicitis, intestinal new-growth, gallstones, concretions in the pancreatic duct, and caries of the spine.

Tuberculosis in the acute stage may furnish few differential symptoms. Here again the necessity of careful and multiple urine analyses is demonstrated. Tubercle bacilli may be discovered in the urine and the tuberculin and inoculation tests are available. In later stages the same tests are applicable, and in addition the large cord-like upper ureter is demonstrable, especially under anesthesia. Later, the lower portion may also be found to be similar. Debris containing the tubercle bacilli may be found in the urine. Perhaps the disease may be detected in other tissues.

Hydronephrosis from other causes will not produce abnormality of the urine, except a deficiency in solids. In the chronic form it does not afford the symptoms of pain and hematuria. When due to angulations or kinks of the ureter it usually gives rise to colicky pain and the train of symptoms significant of renal crisis. The history of deficient quantity of urine, associated with constantly increasing pain and the development of a renal tumor, and the rapid reversal of these symptoms, particularly when relief comes from change of position, offer great differential data. Pyonephrosis does not furnish such clear points of distinction. Indeed, most cases of this condition originate in renal calculus.

Renal neoplasms give rise to pain that is steady, and the development is gradual and progressive. An exception to this is hypernephroma which after considerable development may remain quiescent for long periods of time, again to take on rapid increase in size. Most renal neoplasms are malignant and cause death in a few months. Papilloma is especially likely to produce troublesome hematuria.

Acute nephritis may cause severe pain on both sides and anuria, but it does not cause colic, and the urine affords differential details. Broad ligament tumors and enlarged or calcareous pelvic lymphatic glands may be mistaken, on palpation, for stone in a related portion of the ureter. Pressure of them against the ureter often causes vesical irritation. Here again the history of the case with urine analysis will usually lead to differentiation. In some cases ureteral exploration or even radiography may be required.

Ectopic pregnancy in the first or second month may be confounded with ureteral colic. Usually, however, urine analysis, a searching

history inquiry, and a careful physical examination, perhaps including the interior of the uterus, will permit a clear distinction being made. Fused kidney and kinked ureters offer unusual difficulty in differentiation from renal or ureteral calculus. In this condition the kidneys are in front of the lumbosacral junction and the ureters usually join the kidney at a sharp angle. Calculi in this condition cause localized pain that is confounded with disease of the intestine or of the female pelvic organs; ureteral exploration is confusing, as the ureters are about half their usual length and the renal pelvis is not so amenable to exploration. Many times the diagnosis will be made only by the radiogram or exploratory incision. In double ureter the calculus may be in one of them occluding it, while the other is permeable throughout its length. When this occurs in the ureter that is forked above, ureteral exploration will render but little aid. Reliance for diagnosis must be placed upon the symptoms, urine analysis, and the skiagram. Hepatic disease should be confounded with renal calculus only in so far as a tumor of the liver or distended gall-bladder may be mistaken for an extraperitoneal mass in or about the kidney, and hepatic colic mistaken for renal colic. Usually, such symptoms as jaundice and marked digestive disturbances permit a distinction. If not, urine analysis and ureteral exploration, or, possibly, radiography, will clarify the situation. Many times ureteral calculi have caused a diagnosis of appendicitis to be made. This is scarcely pardonable, however, as the symptoms are commonly at wide variance.

Lucas furnishes an interesting instance of spinal caries being mistaken for renal calculus. He was called to operate and found the child suffering with unilateral pain in the back radiating downward. Incision and drainage proved sufficient. A few days later the same diagnosis was made for the other side. By telegraph he urged searching for a similar abscess on the painful side. It was found and evacuated with relief.

ORIGINAL ARTICLES.

THE ENVIRONMENT IN THERAPEUTICS FROM THE STAND-POINT OF PHYSIOLOGY.¹

By WALTER B. JAMES, M.D.,

PROFESSOR OF THE PRINCIPLES AND PRACTICE OF MEDICINE, COLLEGE OF PHYSICIANS
AND SURGEONS (COLUMBIA UNIVERSITY), NEW YORK.

THE object of the present paper is to review briefly a few of the elements of environment in their relation to the treatment of disease, and to point out some of the ways in which modern therapeutic

¹ Read at the meeting of the Association of American Physicians, Washington, D.C., May 15 and 16, 1906.

practice, especially in hospitals, through neglect of these considerations, sometimes fails to realize all that it might.

With the development of cellular pathology and the discovery of anatomical and bacteriological causes of so many diseases has come an inevitable and useful spirit of materialism in medicine, and a tendency to consider and to concern one's self only with tangible matters—those that can be seen and touched. This has been a useful spirit, and necessary to the transition from the old fantastic medicine of the past to the medicine of the present imbued with and founded upon the principles of science. But with it something has been lost that was of use.

Consideration for the surroundings of the patient has come to be regarded as belonging rather to the care than to the treatment of disease, and so has been left to the nurse. The development of the trained nurse system, too, has contributed to this result, and physicians have often grown unfamiliar with the management of the details of the surroundings of their patients.

But gradually confidence in the potency of many drugs has weakened. Certain of these agents, to be sure, have maintained their position, and probably always will maintain it; but the number of diseases in which we sum up the treatment as consisting of good care and the treatment of symptoms has steadily grown. This list of diseases promises for a long time to be an extensive one, to be shortened only as modern scientific medicine gradually develops specific forms of treatment.

It seems fair, then, every now and then to review the subject of environment in therapeutics, and to examine it in the light of the most recent teachings of physiology, pathology, and experimental medicine, and to see whether it cannot be made worthy of the earnest consideration of the thoughtful physician. It is a very old subject, and one to which much thought has always been given.

Sydenham regarded horseback exercise in the open air as a specific for consumption, and many years ago the open-air treatment of pneumonia was advocated, while mental influence has always been an important part of the armamentarium of every successful physician. The psychical side of environment has long been made use of by neurologists, but mainly in relation to functional neuroses. In a recent work, and one of the most useful that has lately appeared, on "The Psychical Treatment of Nervous Disorders," Dubois makes a powerful and unanswerable plea for the formal consideration of the psychical environment of the individual in many or in most disorders. This work, being based not upon empiricism wholly, but in very large part upon the teachings of modern physiological psychology, deserves the earnest consideration, not only of the neurologist, but of every person who is called upon to care for the sick and injured. It is by no means a new principle in therapeutics, but an old one that needed to be formulated, and whose

place in treatment required to be defined and accentuated; this Dubois has done in a masterly manner.

The use of the psychical side of environment in treatment is limited to no single group of diseases. In the neuroses or in other disorders in which neuroses play a considerable part it must be one of the main dependences; and this principle, as is so well elaborated by Dubois, no longer rests upon empiricism, or upon vague, undemonstrable theories of mental influence, but is firmly founded upon established principles of psychical physiology, both normal and morbid.

But in every case of disease the psychical state of the individual is an important element in maintaining and aiding the reaction of the tissues to any injury, whether of parasitic, metabolic, or other origin. Just as the influence of the environment upon the nervous system is an important element in causing disease, so it can be made equally important in combating disease, not only the neuroses but all organic maladies.

Celsus says "A great many of the inhabitants of cities and towns, and almost all the lovers of learning, have weak stomachs." And then follows a fantastic explanation of this true observation, based upon the faulty idea of physiology, pathology, and psychology current at his writing. Many centuries after, Ramazzini repeated the observation, and also used the same explanation; but now the modern teachings of the anatomy and physiology of the nervous system, and of psychology, and the relation of these elements to one another, have given us a satisfactory scientific explanation of the frequency of digestive neuroses in the classes of persons referred to. Like Celsus, we recognize the frequency of the condition and its dependence upon environment, and we find that modification of this element is the most important single means that we possess in combating the majority of digestive disorders; but the modification of environment from a psychical standpoint belongs to the treatment of every disease, and when it cannot cure, it can often aid other means to either cure or ameliorate.

In hospitals, unfortunately, it is more difficult of application, and as a rule, it is completely neglected. I have seen a clinic in one of the universities of Europe in which the viscera of a patient that died the preceding day were demonstrated and explained in the presence of another patient with the same disease waiting his turn to be lectured upon.

Few hospitals are so arranged that those who are dying shall not be seen or heard by patients in neighboring beds, or so that the psychical side of the environment of the individual shall have any consideration whatever. A few surgical hospitals have recovery rooms in which operative cases can be cared for in some isolation while recuperating from anesthesia, but even here it has generally been done with consideration only for the patients operated upon, and not for the remaining patients in the ward.

In most institutions recovery from anesthesia takes place in the wards, and surely the sight and sounds of the procedure are but poor preparation for similar operations on others. Many other instances might be given of the failure to appreciate the importance of the psychical side of environment in the designing, equipping, and management of hospitals that are supposed to be modern. It is much to be desired that architects, trustees, and others concerned in planning public institutions should give due weight to this important feature, and should realize that it rests not as formerly upon the vague and uncertain ground of hypothesis, but upon the certain ground of the teachings of modern physiological psychology.

Probably the psychical value of segregation is not always clearly understood. The value of sanatorium treatment of many neuroses depends partly upon the association of the patient with others of the same class.

In pulmonary tuberculosis there is a distinct advantage in sanatorium treatment or in treatment in colonies, which cannot be explained entirely on the ground of discipline and methodical and regular life. Contrary to the general belief of the laity, these patients as a rule do best in tuberculosis colonies. The restrictions placed upon their activities and appetite are less irksome, and they fall with more readiness and cheerfulness into a hygienic routine than when they stand alone. They appear to be under somewhat the same psychical influence as soldiers who march farther and with less complaint and exhaustion when in company formation and keeping step than when straggling alone.

One finds the same indefinable but real influence of environment in persons undergoing treatment at health resorts, such as Carlsbad, where the early rising, the nauseous draughts of waters, and the rigid dietetic restrictions are submitted to with the utmost cheerfulness in company, when only open rebellion would often result were the individual asked to go through the same regimen alone.

These will serve as examples of some of the ways in which the psychical side of hospital treatment will bear investigation and modification; and this investigation is all the more indicated, since failure so to consider the environment, cannot be regarded as merely failure to use a measure for good but as perpetuation of conditions that are positively a hindrance to cure.

The physical side of environment includes: (1) Temperature; (2) ventilation; (3) barometric pressure; (4) humidity; (5) light; (6) quiet, noise, etc.

It is not my purpose to take up each of these in detail. Some, as barometric pressure and humidity, do not admit of general artificial variation. The application of others is too obvious to justify discussion. That cheerfulness in the sick-room is to be preferred to gloom, quiet to turbulence, fresh air to a close atmosphere, does not permit of argument; but there have recently been

developed certain general therapeutic tendencies along these lines that promise well enough to justify discussion and wider publication; and there are suggestions that can be made looking toward a more thorough consideration of the question of the physical side of environment, especially from the hospital standpoint, and in relation to physiology, that seem to contain possibilities for much good.

With the discovery of the cause of tuberculosis, has come a thorough rehabilitation of the therapeutics of the disease, together with a conviction of the utter worthlessness, even injuriousness, of most of the older forms of medicinal treatment. Fresh air, feeding, and rest for the disease itself, and medicines only for special indications, and these as sparingly as possible; wherever the disease is well understood, these are the main points in treatment. These measures are based upon the soundest physiological principles. The invigoration of the body furthers the resistance of the tissues to the infection, and so favors cure. At first, the out-door treatment was attempted only in the pulmonary type, and the fresh air was admitted to be of use only because the disease was in the lungs. Then it was found that the non-pulmonary forms of tuberculosis showed just as striking benefit from out-of-door life as did the pulmonary, and now numerous successful institutions in various parts of the world testify to the fact that this is the most satisfactory method of treating tuberculosis of the bones, joints, lymph nodes, and various other parts of the body, where the disease is not susceptible of complete cure by operation. This conclusion, too, is justified by consideration of the physiology of respiration.

A young woman suffered from advanced tuberculosis of the kidney of many months' duration. As a concession to the impaired renal function she was kept closely housed in a warm room maintained at an even temperature, and she was with the same purpose fed upon a restricted diet. She had continuous irregular fever, rapid pulse, progressive loss of weight and strength, and, indeed, all the evidences of an actively advancing tuberculous lesion. She then fell into other hands; the renal function was disregarded, and only the tuberculosis was considered; treatment adapted to pulmonary consumption, or, more properly, to tuberculosis in any part of the body, was instituted; it consisted entirely in rest out-of-doors in all weathers, and forced feeding. Almost at once the temperature became normal, active symptoms subsided, and the evidences of a quiescent tuberculous lesion were substituted for those of an advancing one.

No rational discussion of fresh air can be engaged in without the influence of temperature being considered at the same time. By the use of fresh air in the treatment of disease I mean something quite different from ventilation in the ordinary sense of the term. Most sick-rooms are very inadequately ventilated; many contain

air that is unfit to be breathed even by well persons, and I have never seen a modern, up-to-date hospital that seemed to me to be adequately supplied with fresh air. I believe that the so-called scientific tests of the quality of air in rooms are of only limited value, and cannot be used as a basis of final judgment; I mean, the estimation of the proportion of carbon dioxide and of the number of bacteria, or the amount and quality of dust present. Until some further methods of study are discovered the best test of the air in the sick-room is the sensation of an intelligent and alert physician on entering, or the sensations of an observant nurse after remaining there some hours; while the condition of the patient, his progress toward or from health, his restlessness, and his quiet or sleepless nights will help to a judgment.

In attempting to study the physiological bearing of ventilation, one is beset by the difficulty of determining what are the essential and effective elements of good and bad ventilation. All agree that there are certain well-defined symptoms that regularly appear when people remain in an atmosphere which is called close or stuffy, that is, one that has been occupied and breathed for a considerable time without the air being renewed. The principal symptoms are a feeling of heaviness and oppression, headache, drowsiness, malaise, vertigo, tinnitus aurium, nausea, and faintness. If the conditions are maintained for a longer time, there is loss of appetite, coated tongue, indigestion, nausea, constipation, and nervousness, and, subsequently, if the evil be persisted in, the general health may become seriously impaired, secondary anemia and malnutrition being pronounced features, together with a generally increased susceptibility to the infectious diseases.

It was long a matter of dispute whether these conditions were due to the fact that the air contained poisonous substances, given off from the body, or whether the increased amount of carbon dioxide was the essential feature.

Ransome¹ claimed to demonstrate toxins in the exhaled breath and in the water of condensation from such breath. Merkel² and Brown-Séquard and d'Arsonval³ came to a similar conclusion. These poisons, which they called anthropotoxins, could not be isolated, but their existence was claimed to be proved by experiment. Most subsequent observers have come to the opposite conclusion, namely, that no such toxins exist in the air of expiration—Hermans⁴ (confirmed by Rauer), Lubbert,⁵ Kriegel, Mehl, Hermanek,⁶ Billings, Weir Mitchell, and Bergery.⁷

More recently, under the direction of Flügge, Heyman, Paul, and

¹ Journ. Anat. and Phys., 1870, iv, 209.

² Arch. f. Hyg., 1892, xv, 1.

³ Compte rendu, 1888, cvi., 106 & 165.

⁴ Arch. f. Hyg., 1883, 1, 5.

⁵ Ztschr. f. Hyg., 1, xv.

⁶ Arch. f. Hyg., 1900, xxxviii, 1.

⁷ Smithsonian Contributions to Knowledge, 1895, vol. xxix, No. 989.

Ercklentz,¹ in an elaborate series of experiments upon men and animals, together with extensive chemical tests, confirm the results of the latter group, and declare that the anthropotoxins have no existence. They find that the deleterious effects of close atmospheres consist, not in the carbon dioxide, but in the elevated temperature, humidity, and absence of air currents. Paul placed men in small, close chambers until the atmosphere became very impure, but kept the air in active motion by fans, and found that no symptoms were developed. He then placed them in a similar environment but with the air still, and had them breathe pure fresh air through tubes. Here the regular symptoms of bad ventilation occurred, but were dissipated when the same air was put in active motion.

Flügge concludes that the sensation of well-being experienced with good ventilation is due to the abstraction of heat from the body through the evaporation of moisture from the surfaces, and that the removal of expired air plays a relatively unimportant part. Hence, he concludes that the features to be sought after in the atmosphere are coolness, dryness, and active motion. He considers the CO₂ content relatively unimportant. Rubner finds that it takes but slight motion of the air markedly to increase heat loss.

It has been found difficult to establish the point at which CO₂ in the atmosphere becomes a distinct injury to health. Paul found that animals died when CO₂ reached 14 per cent., and that it was immaterial whether this was produced by the respiration of other animals or by the action of chemicals. The atmosphere of large cities contains about 4 parts of CO₂ in 10,000; that of the open country about 2.5 parts. It has been generally assumed that in rooms it should never go above 10 parts. Flügge's conclusions point to the unreliability of CO₂ determinations in deciding whether an atmosphere is fit for human beings. He seems to conclude that many atmospheres may be good enough to be breathed which are not good enough to be lived in.

His experiments and conclusions carry much conviction with them, and suggest some valuable points in the management of the environment of the sick, such as the use of fans, and the attempt to secure lower temperature and more motion in the air.

It is a matter of practical experience that most modern artificial ventilation systems are satisfactory only to the architects and engineers who have installed them; they are entirely unsatisfactory to those who must live in them.

In view of the above conclusions from experiment it seems probable that this results because the ventilation is devised purely from the standpoint of respiratory requirements, based upon the oxygen needs of the individual, rather than from the cutaneous needs.

¹ Ztschr. f. Hyg. u. Infek., 1905, xlix, 433.

I have had noted and charted the humidity of wards of different type, and at the same time that of the outside air. Even with windows wide open, the humidity in the ward is much above that of the exterior, while it rises still higher proportionately to the number of occupants, and inversely according to the number of windows that are open. These differences are greater in cold weather, but are also present when the temperature outside and within are about alike.

In the modern system, moreover, special effort is made to avoid sensible air currents, while in Flügge's experiments such currents were one of the chief factors in relieving the symptoms resulting from a close atmosphere. In practice in the sick-room and the ward I have always found draughts a far less serious bugbear than they are generally considered to be.

I have put these principles in operation in the hospital wards, and while sufficient time has not yet elapsed to enable me to give numerical results, yet the outcome up to the present has been encouraging and sufficient to justify the continuance of the experiment.

Moreover, I suggest the possibility that air that has been drawn through long, closed ducts, and then superheated over coils of steampipe has lost certain qualities that belong to fresh air. This suggestion is a vague one, I admit, and is not susceptible as yet of scientific demonstration, but is based upon actual experience in hospital wards, and the observation of the difference in the progress of patients in closed wards supplied with a modern artificial ventilating system, and in the same wards after the ventilating system has been cut off and the windows opened.

Canned foods contain the same chemical substances as do the same material when fresh, but they are less well suited to constant, continuous human consumption.

There has long existed a tradition that the sick-room or ward should be maintained at a constantly even temperature, or as near such as may be possible. I should like to know the origin of this tradition, and whether it is founded upon theory or experience. Surely in health the body finds an even temperature far from grateful, and, on the contrary, craves the alternations which, in most parts of the world, are supplied throughout the year by the changing seasons, and through the day by the changing relation to the sun. There are diseases, to be sure—for example, certain cases of nephritis, in which extreme changes of temperature are probably injurious, and in which exposure to extreme cold is to be avoided, although even here one may question whether we have not been overafraid of such influence.

Dr. Northrup has recently seen a case of acute nephritis in a child show marked and rapid improvement, and go on to recovery, when removed from the hospital ward and placed upon the open

roof of the building in midwinter. This, to be sure, is an experiment, and is not to be recommended at present for general adoption. In this case the environment was changed because the child was doing badly and showed unfavorable nervous symptoms.

I have, however, tried the effect of marked alternations in the temperature of sick-rooms and wards, opening the windows wide in midwinter, and have found only improvement to result. This improvement, it is true, has followed the combination of change in temperature and the admission of fresh air, and I have concluded from it, as far as temperature itself is concerned, merely that in most cases there is no advantage to be had from the maintenance of the sick-room at an even or at any fixed temperature.

The experiment has been tried in medical wards containing such patients as are generally to be found in any acute hospital, and thus far has indicated that except in cases of advanced disease of the kidneys and heart, and with consideration for the personal comfort of the patient, the temperature of the room or ward may be disregarded.

At present, as a rule, the temperature is adopted to meet the comfort of thinly clad nurses, or, in private practice, of some elderly relative.

In most hospitals the rule obtains that the wards are to be kept at as near as possible to 70° F. both day and night; thus, as far as treatment by this feature of environment is concerned, forcing all patients alike into one class, no matter what the nature of their disease may be.

The influence of good ventilation in pneumonia has long been recognized, and is insisted upon by all who write upon this disease, but the idea has never become popular with the laity, though recently it is growing easier to obtain a reasonable supply of air for the patient when one is dealing with intelligent people. The majority of the medical profession are equally ignorant, however, and sin in the same direction. But even good, normal ventilation is not sufficient for a patient with pneumonia. He should have fresh air; as near as possible an approach to out-door treatment, unless there is some special contraindication.

Von Leyden¹ devotes thirty-two pages to a masterly discussion of the treatment of pneumonia, but dismisses the question of environment with but a few scanty and insufficient words. Most text-books preface the section on the treatment of pneumonia with the statement that the room should be kept at an even temperature. I have demonstrated by abundant experience not only that there is no advantage in the maintenance of an even temperature, but that the natural daily fluctuations of temperature are of value to the patient, and I believe it would be a distinct step in advance if

¹ Die Deutsche Klinik, ii, 243.

we would discard from the sick-room the ordinary thermometer, and put in its place the wet and dry bulb thermometer, or one of its more readily interpreted and sufficiently accurate substitutes.

In tuberculosis the worst possible environment is a close, warm room, such as is maintained, as a rule, for pneumonia. Far better, but still inadequate, is a normally well-ventilated room, but by far the best is absolute out-of-doors. As a result of actual trial I have concluded that the same rule holds good for pneumonia.

In the case of adults, I have kept them in either a small room, or in the end of a ward, between two widely opened windows, with an absolutely free circulation of air, and at a temperature in winter that compelled the nurses to wear overcoats.

Dr. Northrup has carried the children with pneumonia to the roof in the early morning and kept them there throughout the day, and this in winter and often without even a wind-break.

I realize the difficulty of estimating the value of any plan of treatment in pneumonia from a study of the mortality statistics, that is, in a moderate number of cases; so I will merely state that the experiment was tried on my service at the Roosevelt Hospital and the Presbyterian Hospital, and in Dr. Northrup's service at the Presbyterian Hospital during the past winter, and the ultimate results, as far as mortality is concerned, were at least as good as with ordinary closed-ward treatment. More definite data can be obtained from a study of the symptoms, and we have noticed that exposure to the open air has had somewhat the same effect upon the nervous symptoms as has the cold bath in typhoid.

Nervousness and restlessness diminish, delirium is less frequent and less active, the patients sleep better at night, and the tongue is less likely to be dry.

I have not noticed any influence upon the duration of the disease, or upon the incidence of complications. I have been surprised to note that, as a rule, the patients have liked the treatment, and have not complained of the cold. In no case has the patient caught cold or developed a complication that could fairly be ascribed to exposure to a low or changing temperature.

Impressed with the satisfactory behavior of the nervous symptoms in pneumonia, I was encouraged to try the treatment of typhoid fever by the same environment.

The number of cases at my disposal was too small to admit of safe generalization, but as far as the experiment was carried the results were satisfactory, and suggested the likelihood that the fresh air treatment in this disease would be found in certain cases a satisfactory substitute for cold baths. The behavior of the tongue and of the nervous system suggested the conditions that are found when cold baths operate successfully. Even if of moderate benefit, though less so than baths, it would still be of much use in many

cases in which baths are contraindicated, or in which it is not possible to carry them out satisfactorily.

In private practice baths are of limited utility, and are not widely used, requiring so much and such skilled assistance as to be available only for the wealthy, while, unless carried out in the best manner, they are not free from danger. I suggest the substitution of fresh air treatment under those circumstances, which, in addition, has the advantage of harassing the patient less and subjecting him to no risk of injury.

The influence of fresh air upon the nervous system is easily demonstrable in many different diseases; but by fresh air I mean not what would be regarded as good ventilation in living-rooms, but fresh air as it is met with best out-of-doors, or, if this cannot be arranged, in rooms with wide-open windows. The evil effects of the opposite condition upon the nervous system are easily demonstrable. After a night spent in a room with closed windows and a temperature maintained by artificial heat, following wakefulness and restlessness through the night, there is apt to be headache, mental depression, a lack of buoyancy, a coated tongue, and a lack of appetite in the morning. These symptoms are not easily explained, but do not seem to be due primarily to deficient oxygenation, for they need not be present in persons who have diminished breathing space from disease of the lungs, and whose oxygenation is markedly below the normal. In several diseases in which disturbance of the nervous system plays a prominent part, these symptoms have diminished under the influence of a continuous stay in the fresh air. I have treated cases of typhoid fever lately by placing them before open windows, covered only by a sheet. The number of cases so tried has been too small for generalization, but the results are that such treatment may approximate in its effects upon the nervous system to those of cold baths, and the patients have found the procedure a pleasant one. One young woman with severe typhoid fever was kept in a room with wide-open windows, in which the temperature was at times 36° F. Along the line of Flügge's demonstration, I would suggest the use of fans systematically for these cases in warm weather. In no case have any unfavorable symptoms resulted from the treatment.

From many similar observations, I may quote two patients with cerebrospinal meningitis, who entered the hospital at about the same time, and occupied beds in the same ward, which was ventilated by the modern closed aspiration system and had the windows permanently closed. Both patients were severely ill with the ordinary symptoms of the disease. They were mildly delirious during the day, and were actively delirious during the night, and slept only when under the influence of opiates. Then the ventilating system was cut off from the ward, and the windows opened, the temperature falling to from 50° to 55° or even lower, and with a

very free circulation of air, the winter wind blowing freely through the room. At once the patients began to sleep better, and from this time no opiates were needed.

The same experience was met with in other cases of cerebrospinal meningitis, which was epidemic in New York in the winter of 1904 and 1905. Subsequently these cases were regularly segregated in special rooms where the fresh air method was carried out as an important element in their treatment.

In pneumonia it is especially the nervous symptoms, delirium, restlessness, etc., that are improved by out-door treatment.

Several years ago when the importance of this segregation and rational treatment of cases of tuberculosis in public institutions was first recognized, the late Dr. Dent, of the Metropolitan Hospital for the Insane on Ward's Island, removed the cases of tuberculosis in that institution to tents, and subjected them to modern, out-door treatment. He was prepared to see improvement in their pulmonary symptoms, but was surprised to find an equal or even more marked improvement in their nervous symptoms, especially a diminution in restlessness and violence, and a lessened need for restraint. He then tried the same environment upon the other inmates of the asylum, and found an equal improvement in their nervous symptoms; the number of the disturbed patients was less, and restraint was much less often called for. Some of the most successful sanatoria for the treatment of neurasthenia find absolute out-door life one of the most useful elements of treatment.

The influence of environment upon digestion is almost equally striking. By good or bad ventilation, by cheerfulness or gloom, by amusement or boredom, the appetite can be made vigorous or fickle, the tongue clean or coated, the digestion good or bad, and even the activity of the bowels may be modified. Nothing is more striking in places devoted to the out-door treatment of tuberculosis than to notice the enormous quantities of food that are taken with relish and digested with comfort by frail men and women whose lives are spent in steamer chairs on open piazzas without any activity, either bodily or mental. I have known patients with acute phthisis, when living thus constantly out-of-doors both day and night, maintain both appetite and digestion unimpaired until a few weeks before death. Experience surely suggests that it is the out-door element in the treatment chiefly that has kept the digestion thus vigorous.

In some of these very severe cases of nervous dyspepsia in which the usual remedies are of no avail, even when combined with rest in bed, I have known improvement begin when to the rest of the treatment was added fresh air out-of-doors; and I believe that this element is capable of being made of much use in combating this obstinate disease.

There are certain diseases in childhood in the management of

which environment can be made to play an important part, and in relation to which this form of treatment has been too much neglected. I saw a good example of these recently in conjunction with Northrup, to whom we owe many valuable and vivid suggestions in this direction. A boy of five, in good circumstances, had shown a mild type of rickets from an early age, in spite of the best feeding and suitable medication. Talking, walking, and dentition were delayed. There was a pot-belly and a slight rickety rosary, and the other symptoms of the disease were present, but in mild degree. Careful and judicious treatment, dietetic and medicinal, had failed to remove the trouble, although the child was living in the country in excellent surroundings. Then, at Northrup's suggestion, the entire scheme of life was changed. The parents were persuaded to build an open playground on the roof, and this the child occupied throughout the entire day, never going into the street nor to Central Park, although this was not more than a few hundred yards from his home. The bed-room windows were opened wide, and so thorough was the ventilation that a fur coat had to be provided for the trained nurse's use when she had occasion to get up in the night. In this way there was obtained for the child continuous life in the open air, free from dust contamination of the street, together with absolute freedom from nervous excitement and the stress of competition with the other children of the family—with a marked diminution in the number of visual, aural, and other mental impressions received.

The result was better even than had been expected, and though no new diet or medication was instituted, the child made more progress in the next two months than he had made in as many years. Here the treatment was entirely by environment, and I would suggest a wider application of the same principle in similar cases, and especially an effort to attempt its introduction in hospitals for children.

In the case above described, it was not entirely the open-air life, for he had passed the preceding two years in a healthful locality in the country, but it was the judicious combination of all the elements of environment that could be made of benefit to him.

In New York City the children's playground on the roof is becoming a common feature of many homes.

Last year during the summer in one of the Metropolitan Hospitals, in order to allow repairs to the wards, the children were removed to the yard and temporarily housed in tents. Not only was there marked and obvious improvement in the patients, but the commissary department of the institution drew attention to the bills for food, and complained that these were nearly doubled. There was some consolation, however, in noticing at the same time that there was a considerable lowering in the size of the bills for drugs.

The little hospital for non-pulmonary tuberculosis in children maintained by the Association for Improving the Condition of

the Poor at Coney Island, New York City, constitutes one of the best practical lessons in the use of environment. Here, the little patients spending the entire year on the seashore absolutely out-of-doors, or with unclosed windows, in all weathers, make remarkable progress, while colds and sore throats are unknown.

Several years ago in one of the Lying-in Hospitals of New York City, a patient with puerperal fever was put upon the roof, and kept there during the course of the disease. I have recently adopted the plan of putting these cases in an environment as nearly resembling out-of-doors as possible, and without regard to atmospheric temperature, combining this with as near perfect quiet as can be obtained in a hospital, and with forced feeding. The number of cases treated has not been large enough to justify a definite conclusion, but the results thus far certainly encourage a continuance of the experiment.

The influence of light upon disease is difficult to determine accurately. This agent is known to hinder the growth of bacteria and to aid in their destruction, and also to increase tissue oxidation. Curiously, the absence of a normal amount of light in the environment has been found by Weber to give rise to symptoms similar to those produced by a close atmosphere, namely, diminution of energy, depression of spirits with loss of appetite, indigestion, coated tongue. This field deserves further study. Sun baths or the exposure of the whole body to direct sunlight are used extensively in many sanatoria, and a valuable action upon the nutrition and upon the nervous system is claimed for them.

The action of α -rays, the Pinsen light, radium, and other applications of light in the treatment of diseases indicate that this agent may be used with advantage in therapeutics, while Nevin's claims that epithelioma of the skin may be caused by the action of direct sunlight also suggests the potency of the light rays.

The exact part that light may be made to play in the management of environment in disease requires extensive observation and experiment to establish, but it is a field that would repay investigation. Meantime, consideration of the lighting and coloring of hospital wards and sick-rooms may certainly be made to play an important part in the therapeutic and the psychological side of environment.

But it is especially in connection with hospital practice that I desire to emphasize the importance of escaping from the trammels of tradition, and of starting anew to work out the treatment of the patients in part through environment, and of attempting to apply to the treatment of many diseases those principles that have proved of such inestimable value in a few, and which need not in any way interfere with such other therapeutics as may be indicated, whether specific or symptomatic. At present, as far as environment is concerned, the average hospital is an inelastic unit. Drugs may be varied to suit the needs of individual patients, and even the

diet to some extent, but the environment is rigid, and is adapted to but a small part of the inmates, if any.

In many institutions the profligate use of coal maintains the temperature of wards uniformly day and night at as near as may be to 70° F. A closed system of ventilation maintains an atmosphere that causes headaches in nurses and physicians who must spend many hours in the wards. The patients are assigned to this or that service, being distributed to suit the convenience of the visiting physicians. Hence, it comes that the sun shines alike upon the patient with acute tuberculosis, who needs it, and upon the one with cerebrospinal meningitis, who suffers the keenest photophobia. The bright, sunny ward, with raised curtain shades and walls painted a light color, is admirably adapted to the convalescent or the neurasthenic, but poorly adapted to the needs of patients with typhoid fever in the acute stage.

Almost more difficult to reconcile are the conflicting needs of the man with acute nephritis, general anasarca, and suppression of urine, and of the one with acute lobar pneumonia. But both, as a rule, must have the same atmospheric temperature, the same kind of ventilation.

I realize that the natural limitation of the function of the hospital precludes the possibility of providing separate rooms, or even small wards, for the patients. Moreover, the construction of most hospitals makes it difficult to provide for each individual the exact environment he would find best. Yet in most cases an intelligent effort to apply to hospital patients those principles of treatment by environment which are the outgrowth of modern scientific medicine, and some of which I have already briefly outlined, will undoubtedly result in making hospital results correspond more closely to those obtained in private practice.

In institutions with more than one ward devoted to each sex, these wards should be assigned to groups of patients according to their therapeutic needs, rather than to individual visiting physicians.

Thus, the wards could be made to vary in temperature, air currents, light, and quiet; and so some approximation at least of adjustment of surroundings to the needs of the sick could be carried out. The slight increase in administrative difficulty would be more than counterbalanced by added efficiency of service.

During the last year in two of the hospitals with which I am connected, I have attempted to carry out the above plan. In one institution I was allowed no expenditure of money whatever. The medical wards are the long, narrow type, containing twenty-eight beds each. At the far end is a hallway lying between the lavatories, and having a very large double window, and closed off from the wards by doors. This was used as an out-door space, the windows being widely opened and the door to the ward kept closed.

Here the temperature was not far above that of the street, and here were kept certain cases of pneumonia, or typhoid fever, or acute tuberculosis, within the limits of the space at my disposal.

One end of the ward itself was maintained with closed shutters and open windows, and here the air was fresh and the temperature varied with that out-of-doors, ranging from 45° to 60° or more. The closed shutters brought about a subdued light. In the other end the windows were closed and the shades raised.

I was surprised to find that the temperature in the two ends of the ward varied at times as much as four degrees, while the free circulation of air through the open windows made the apparent difference much greater.

Thus, without the expenditure of any money and with no structural changes whatever, I was able to secure in this ward three essentially different forms of environment, and kept the patients distributed in accordance with the nature and progress of their complaints.

In the other hospital, there had been certain superficial structural changes introduced, which made the conditions much more satisfactory. The ward had been partitioned and the wall of one part painted a dull green, and the windows provided with green shades. Here the windows are kept open, and acute cases, needing fresh air, quiet, and a subdued light can be given a suitable environment.

Meantime, suitable provision is being made on the hospital roof for the accommodation of all patients that would be benefited by absolute out-door surroundings.

I have been interested to notice that since the introduction of the above changes the health of the nurses has materially improved.

I would here put in a plea for the more general and systematic use of hospital roofs, and would suggest that the architectural definition of roof be changed, as far as it applies to hospitals, and that hereafter, this structure be defined as the floor of the top story.

The children's playground on the roof is rapidly becoming a familiar feature of the newer houses built in New York, while more and more hospitals are learning that their roof space can be made one of the most valuable therapeutic assets. With the downfall of tradition as the ruling spirit in the construction and utilization of hospitals, it might fairly be hoped that the assumption that medical hospital treatment is for the most part expectant might be done away with, and that our activities in behalf of our patients might rival even if they do not equal those of our confrères of the surgical side.

In the foregoing discussion it is not intended to try to cover more than a small portion of the environment in disease, but rather to

call to its consideration more general thought than, as a rule, it receives, and to suggest that the adjustment and maintenance of this element in therapeutics, both in private and in hospital practice, be reviewed in the light of the modern teachings of physics, physiology, and experimental medicine.

THE PHYSIOLOGICAL LIMITATIONS OF RECTAL FEEDING.¹

BY DAVID L. EDSALL, M.D.,

ASSISTANT PROFESSOR OF MEDICINE, UNIVERSITY OF PENNSYLVANIA.

THE title of the subject that has been given me to discuss implies, of course, a question to be answered; and the essence of that answer may be compressed into the statement that the limitations of rectal alimentation are very narrow—much more narrow, indeed, than is commonly appreciated. In saying this I mean only its limitations as a means of furnishing food, not, of course, its therapeutic limitations as a means of combating symptoms. There is a widespread feeling that when one is using rectal alimentation and the success of the measure is not interfered with by irritation of the bowel, one is using a substitute for natural feeding by the mouth that, while not perfect, is by no means a bad substitute. It is somewhat generally believed, indeed, that in a very considerable proportion of cases, the results are so good that the patients maintain a nutritive equilibrium or actually gain tissue, even though no food is taken in the normal way. This is not merely a common belief in the profession at large; it is the teaching of a large proportion of clinical instructors. As a general belief, however, it is extremely erroneous.

If one examines into the reasons for this prevailing opinion, one finds that it is partly due to the mere acceptance of tradition, partly founded upon expressed opinions of clinicians; these opinions, however, being in most instances the result of loosely gained impressions rather than of accurate observation. When patients so fed have been carefully observed, especially when they have been weighed, it is usually found that they lose in general nutrition and that they often lose a great deal of weight; and if the actual absorption is determined, the results seem, in almost all instances, still less encouraging.

Patients may, as is frequently claimed—and, indeed, they often do—feel better as the result of exclusive rectal alimentation than they did before; but this is by no means direct evidence that they have improved in nutrition. It is more commonly evidence that the local disease that is the cause of their chief complaints has improved.

¹ Read at the meeting of the Association of American Physicians, Washington, D. C., May 15 and 16, 1906.

So severe a measure is not ordered unless there is decided reason for it, such as protracted and troublesome vomiting, gastric ulcer, or obstruction to the passage of food through the œsophagus or the pylorus. If food produces vomiting or severe pain when taken into the stomach, stopping food by the mouth will usually cause great relief; but it does not wholly ease the mind of either the doctor or the patient, for neither of them can let absolute starvation go on for a considerable length of days without a disquieting feeling of danger.

Patients who are permitted no food by the mouth, and those that have, for instance, for a long time been more or less starved by œsophageal obstruction, have much of this disquiet and much of their sense of starvation dispelled, and the accompanying symptoms relieved, by the knowledge that they appear to be having a goodly amount of food administered in other ways than by the mouth. A considerable portion of whatever well-being is observed in patients that are nourished exclusively by the rectum is undoubtedly often due to this psychical effect. Such effects are by no means trivial and unimportant, and they are no longer scorned by those who would be scientifically accurate. Pawlow and those who have followed his suggestions have demonstrated in a highly illuminating way definite physical effects of psychical factors; and common experience shows the profound influence that such factors exert upon hunger and appetite. In the case of rectal alimentation, I know that the psychical effect can be very striking. In two cases in which Dr. Caspar Miller and I studied the absorption during exclusive rectal feeding, and in which, therefore, we knew just how much nutritive effect the enemas had, the patients told us that their hunger, which appeared intense, was quieted almost completely *within a few moments* after every enema; and each patient was quite convinced that she was being generously fed in this way; yet each was absorbing an amount so small that if the entire quantity obtained in twenty-four hours had been served at one meal to be taken in the usual way, it would have been a bitter disappointment to a hungry person; for the total absorption in each case in the twenty-four hours was just about equal in food value to a good-sized glass of milk.

Another reason why rectal alimentation actually does good without really furnishing much tissue-building food—a very important reason, and one that can be more clearly appreciated than the psychical effect—is because patients that require exclusive rectal alimentation are almost always suffering from lack of fluid as well as from lack of food. It is common knowledge that great reduction of fluid is more tormenting in its effects and more quickly disastrous than is reduction of food; and a moderate reduction, providing it is abnormal in its extent, differs only quantitatively in its effects from extreme reduction. Nutritive enemas always contain a large proportion of fluid; and most of this is quickly and readily

absorbed, and tends greatly to the well-being of the patient. It may, indeed, supply what is, for the time being, his most serious demand; and since a goodly proportion of the water may be retained by the parched tissues, the patient may even for a time gain in weight, and thus offer apparently important evidence that he is building tissue when he actually is not.

The salts, too, that are contained in nutritive enemas are in part absorbed, and they are undoubtedly of use in the organism and explain a certain portion of the useful effect.

In these ways, then, in furnishing mental satisfaction, water, and salts, rectal alimentation is always very useful when indicated; and it practically always provides in this manner a direct and positive gain for the patient. Were these purposes the only ones in view, exclusive rectal feeding might frequently be continued for a long time without harm, and often with profit.

The story is different, however, with the foods, as this term is commonly used; that is, with the organic tissue-building and energy producing elements—the protein, fats, and carbohydrates. All are absorbed to some extent when administered by the lower bowel; but all are absorbed much less freely than is commonly thought, and far less freely than when taken by the mouth. The total amount thus obtained is, in almost all cases, so small that, instead of benefiting the patient's nutrition by this means, one usually plays a losing game so long as it is continued. I would make it clearly understood that I do not mean that it is a harmful procedure, however. It may, in many cases, be knowingly and wisely undertaken. What I do mean is that, in a great majority of cases, the actual status of rectal alimentation as a method of nourishing patients is that it is a modified and partial starvation. It does furnish some food, and is, therefore, decidedly better than simple starvation; but it is nearly always a marked degree of starvation, and should be recognized as such and not be given a higher place than it deserves.

When used on account of troublesome vomiting or any other transitory cause, rectal alimentation is, of course, in suitably chosen cases, an entirely proper measure; and I would not offer the faintest protest against it. It is, however, important to recognize that, as a rule, one is by this means providing the patient with a wholly insufficient amount of nourishment; that it is, therefore, not to be undertaken lightly and with any feeling that nutrition is being well maintained; that more harm than good is likely to be done, if it is undertaken with the purpose, not merely of guiding the patient through a period of temporary severe gastric irritation or the like, but with the belief that it will improve general nutrition; and it must be remembered that, if other more promising measures can be used—especially if some surgical measure, such as gastrotomy for œsophageal stricture, is projected—one should not delay long

with rectal alimentation in the hope of making the patient's condition more suitable for operation. After sufficient water for the tissue-needs has been absorbed, the progress in general nutrition is usually downward, and the proper course to pursue is to operate soon; or in instances in which surgical measures are not in place—for example, when the trouble is prolonged severe gastric irritability—the proper course is to attempt soon to provide nourishment by the natural means, through painstaking choice of suitable diet and other measures. The length of time throughout which rectal feeding is in place is usually short. Ordinarily, to be sure, exclusive rectal alimentation is used for short periods only; but even then the degree of starvation that it involves may be a matter of moment, and one should reckon with facts and not with traditions. When there is thought of using it for longer periods, this is still more important.

The foundation upon which I have based these statements is the work that has been done on the actual quantity that is absorbed from nutritive enemas. Together with Dr. Caspar Miller, I have made several such studies,¹ and in reporting them most of the important literature was discussed.² I need not, therefore, repeat at length the results of our work or that of others. These results demonstrate, in the main, that protein and fats show a very poor percentage of absorption by this channel; and when it is, at the same time, considered that the whole amount that can be successfully administered in this way is much below the amount normally taken by the mouth, the total actual absorption proves even smaller than the percentage-absorption would indicate. Some investigators consider that the fat-absorption scarcely passes ten grams a day; and, as a rule, the protein-absorption certainly but rarely equals twenty grams. Dr. Miller and I obtained slightly more favorable percentage-figures than many other workers; but, at best, we could reckon the value of all food absorbed in our most favorable cases at less than three hundred calories in a day, and usually it is not above two hundred calories. The latter amount is not one-sixth of the absolute demands of most persons, even of most sick persons, if they are to be kept from losing tissue, and especially if they are to have their nutrition improved.

Even these figures were, in our cases, and certainly in most others, unquestionably too high. In our work we made no attempt to determine the carbohydrate-absorption, for we considered the results too unreliable, owing to the disturbing factor of bacterial action. In order, however, to give as much credit as possible to nutritive enemas, we reckoned in all the carbohydrate as absorbed.

¹ University Medical Magazine, March, 1900; University Medical Bulletin, 1903; American Medicine, Feb. 4, 1905.

² Reach, *Centralblatt f. die Grenzgebiete der Med. u. Chir.*, 1904, Band vii, Nos. 8 and 9, contains a very extensive collection of literature.

This we knew was erroneous, but we did not know how extensive the error actually was. In all probability, a very large part of the carbohydrate is really not absorbed. Investigators have varied in their opinion concerning this point, and in almost all the work, the extent of bacterial action could not be reckoned with exactly. The most valuable studies of the absorption of carbohydrates through the lower bowel that have been made are those of Reach,¹ who carried on his work by determining the effect upon the respiratory quotient, which is undoubtedly the most convincing indicator of the amount of carbohydrate that reaches the circulation. He obtained results that were very low, much below those that had been obtained merely by studying the amount remaining in the feces. If his results are correct, the figures that I have mentioned for the total nutritive value of ordinary rectal feeding are actually decidedly too high.

In a recent extensive study, Boyd and Macpherson² reached just about the same conclusions in regard to the protein and fats, as well as in regard to the total caloric value of this method of feeding, as those reached earlier by Dr. Miller and myself, and by most other recent students of this matter.

In regard to the carbohydrates, their views are more encouraging, but they are based upon the opinion that bacteria exert an extremely slight effect upon sugars in the lower bowel. Their experiments upon this point are, however, not entirely convincing; some important details are not mentioned, particularly the strength of the sugar-solutions that they inoculated with colon bacilli in order to study the effect of these bacilli in breaking up the sugar. In judging of the importance of their results, it is of considerable moment to know whether these solutions were dilute or strong. If the former, their results may be correct; but if the solutions were strong, they would hinder bacterial growth and activity. At any rate, studies of the same point by other persons have repeatedly indicated a very much more extensive action of the colon bacilli on sugars than that found by Boyd and Macpherson; and furthermore, in the intestine we are not dealing with colon bacilli alone, but with various other organisms that are capable of acting energetically upon sugars. At present the testimony certainly indicates that a very considerable part of the sugar administered per rectum is broken up by bacteria, and, therefore, is not received by the organism in a form suitable to maintain nutrition. That a noteworthy part of the protein and fats is also broken up and rendered useless, perhaps in part mildly toxic, is indicated by observations that Dr. Miller and I made on the ethereal sulphates; these studies as well as ordinary clinical observations show that intestinal putrefaction is often excessive when rectal alimentation is being used. Certainly, there is no

¹ Archiv. f. exper. Path. u. Pharm., 1902, Band xlvii.

² Scottish Medical and Surgical Journal, 1906.

reason to modify the statement that I have made that two hundred calories per diem is, with our present methods, a reasonable amount to expect most patients to absorb from nutritive enemas.

In rare instances, cases that have been carefully observed seem to have shown a larger degree of absorption than this. At times, indeed, practically the whole bulk of the enemas seems to have been absorbed throughout weeks of their use; and the patients have maintained good nutrition, or have even appeared to improve in nutrition. These cases are, I am sure, rare; and there are very few reliable instances of this kind on record. Personally, I have never seen such a case. Since, however, they undoubtedly do occasionally occur, an explanation for them is needed, if what I have previously said is correct. This explanation is, I believe, to be found, as I have stated elsewhere, in peculiarities in those persons that permit of the reflux passage of a large part of the nutritive enemas through the ileocecal valve. Digestion and absorption of the food would then occur in the small intestine, practically as in normal circumstances. This explanation is opposed to the views of a number of prominent students of digestion who have insisted that reflex peristalsis that carries large amounts of substances along the intestines does not occur. That, however, active reflex peristalsis does occur constantly in the large intestine has been very clearly shown by Cannon; and that in occasional instances the ileocecal valve does permit of the passage of large amounts of substances from the large intestine into the small intestine is clearly demonstrated by a number of cases that I referred to in previous papers,¹ by one that I observed myself,² by those cases mentioned by Rolleston,³ and also by several cases reported from other sources. In these instances large quantities of easily recognizable substances introduced per rectum were carried backward throughout the whole course of the digestive tract, to be ejected ultimately per oram. Since this has been clearly shown to occur occasionally, I see no reason to question that it may be at least one cause of the occasional good absorption of nutritive enemas. An additional reason for believing this is the fact that most of the cases that have shown this reflux transport of substances from the rectum to the upper alimentary tract have been instances of hysteria, and likewise an extremely large proportion of the cases that seem to have been well nourished by rectal feeding were also cases of hysteria.

I may, in conclusion, refer very briefly to some possible ways in which rectal feeding may in the future be somewhat improved. The high food-value of fats (more than twice that of protein or carbohydrates) would make them extremely valuable for rectal

¹ *Loc. cit.*

² *American Medicine*, October 10, 1903.

³ Editorial notes in American edition of Nodding's *Diseases of the Intestines*, p. 78.

feeding if they were moderately well absorbed, but, unfortunately, they are very badly absorbed. Their importance as food-stuffs led Dr. Miller and me to attempt to improve their absorption per rectum by trying to provide a form of soap that would be easily absorbed and not irritate the bowel; and also by trying to find means of emulsifying fats so that the emulsion would persist for a long time in the bowel, instead of being quickly destroyed, as is the case with the emulsion of fat in milk and egg-yolk, for instance. Our experiments with soaps were unsuccessful. Those with artificial emulsions were somewhat more encouraging, and we got rather better figures for absorption in this way than when we had used milk and egg-yolk. So far as we have gone, however, we have not advanced much beyond the ordinary methods of administering fats; and our process is, as yet, scarcely worth the additional trouble that it causes. It may be possible, in the future, to make some improvements that will largely increase the value of fats as a rectal food.

As to protein, von Noorden's suggestion (which he states that he is having investigated), that the ultimate digestion-products of protein (the various aminoacids, etc.) may be better absorbed by the lower bowel than native protein or albumoses and peptones, is worth attention, though serious difficulties, practical as well as technical, are almost sure to be met.

In regard to carbohydrates, it seems to me that the most useful suggestion is that of Reach, who found that dextrins had more effect upon the respiratory quotient than the other carbohydrates that he had studied, and appeared, therefore, to be better absorbed than others. On the basis of this, he recommends their use in nutritive enemas. They are, at any rate, usually soothing rather than irritating—contrary to the sugars—and they would also be much less easily broken up by bacteria than would sugars, perhaps scarcely at all.

One suggestion that has been made is that it may be possible, by introducing substances that tend to produce reversed peristalsis to encourage the passage of food from the large intestine through the ileocecal valve and thereby increase absorption in the small intestine, where it normally occurs readily. It is hardly to be expected that much success would result from attempts to carry this out; and indeed, from Cannon's observations of the normal occurrence of antiperistalsis in the large intestine, it would seem an irrational procedure, because unnecessary. The difficulty does not lie in the absence of movements in the large intestine that would carry the food up to the ileocecal valve, but in getting it to pass this valve. While I do believe, as I have stated, that in rare instances considerable amounts of food actually get by the valve, and that perhaps small amounts often or even constantly pass through, it is quite certain that, as a rule, no considerable portion succeeds in doing so.

No method of accomplishing this appears evident, and whatever may be done to improve rectal feeding, will, I think, be done in other ways.

**THE RESULTS OF THE USE OF REFINED DIPHTHERIA
ANTITOXIN, GIBSON'S "GLOBULIN PREPARATION,"
IN THE TREATMENT OF DIPHTHERIA.**

BY WILLIAM H. PARK, M.D.,

DIRECTOR OF THE RESEARCH LABORATORY OF THE DEPARTMENT OF HEALTH, NEW YORK CITY,

ASSISTED BY

BINFORD THRONE, M.D.,

RESIDENT PHYSICIAN, HOSPITAL FOR CONTAGIOUS DISEASES, DEPARTMENT OF HEALTH,
NEW YORK CITY.

(From the Research Laboratory of the Department of Health, New York City.)

ALL who use diphtheria antitoxic serum extensively are aware that in from 10 to 30 per cent. of the injected cases of diphtheria, pronounced rashes, of an urticarial or erythematous type, occur. In the majority of cases these serum effects are disagreeable rather than harmful, but occasionally the rash is accompanied by constitutional disturbance presenting, in the most severe cases, high temperature, vomiting, prostration, and sometimes other symptoms. These marked constitutional reactions are especially likely to follow very large injections of from 10,000 to 20,000 units in young children who have high temperatures due to bronchopneumonia or other complications. In these cases the serum reaction is distinctly harmful, for by lowering the general resistance of the body to other infections it neutralizes to some extent the good done by the neutralization of the diphtheria toxin by the antitoxin. Furthermore, the rashes, especially those of a scarlatinal type, are puzzling in a diagnostic sense.

There have been many attempts made to separate diphtheria antitoxin from the non-antitoxic portions of the accompanying serum. Those interested in the chemical side of these investigations are referred to the recent article by Gibson.¹ In 1900 Atkinson, working in this laboratory, eliminated all but the globulins from the antitoxic serum. This partially refined antitoxic serum was tried in 36 cases. The results,² both as to antitoxic effect and serum reactions, were so nearly identical with those in an equal number of cases treated with the whole serum from the same horse that it did not seem to be worth while to go to the expense of preparing such an antitoxic solution. Attempts to effect a practical

¹ Journal of Biological Chemistry, vol. i, Nos. 2 and 3.

² Archives of Pediatrics, November, 1900.

separation of the antitoxin from a greater portion of the proteid non-antitoxic substances of the serum were continued. In August, 1905, we began trials with an antitoxic solution from which much more of the serum proteids had been eliminated than in the Atkinson preparation. Dr. R. B. Gibson, bacteriologist in the Research Laboratory, placed the half-saturation ammonium sulphate precipitate derived from the antitoxic serum in saturated sodium chloride solution, and found that along with a portion of the globulins all the antitoxin passed into solution. In this way the nucleoproteids and the insoluble globulins present in the Atkinson preparation were eliminated. The soluble globulins precipitated by acetic acid were filtered, partially dried, and finally placed in a sac of parchment membrane and dialyzed in running water. This antitoxic solution of soluble globulins was then rendered neutral, and sufficient sodium chloride was added to make it isotonic.

In carrying out the process there is a loss of about 30 per cent. of antitoxin units, because of retention upon filters, loss in dialyzing, etc. On testing this solution on a number of children we found that the results were favorable, except that more local pain was produced than with the whole serum. Stricter attention to the neutralization soon overcame this, so that when the serum was injected on one side and the globulin solution on the other the patient was unable to tell the one from the other. In October, 1905, the antitoxic globulin solution was administered by the medical inspectors not only in the hospitals for diphtheria but also in private homes. Since December it has been gradually distributed throughout New York City, and is now the only form of antitoxin supplied by the Health Department.

RESULTS FROM THE USE OF ANTITOXIC GLOBULIN SOLUTION. The antitoxic effect was identical with that of the whole serum. Our tests have shown that not only the toxins and the so-called toxones produced in media by diphtheria bacilli, but also those produced in the animal by injections with living diphtheria bacilli are neutralized completely by the globulin solution. We could not detect the slightest evidence that any desirable substance in the antitoxic serum is lost by the refining process. Not only we ourselves, but the resident and attending physicians watching the cases in the contagious disease hospitals noted that the rashes following the injections of the globulin solution seemed to be less severe than those which followed the injection of whole serum. It was especially noted that there were very few who had any constitutional disturbances even when the rashes did appear.

As the serum supplied by different horses, or from the same horse at different times, is known to vary in the rashes and other after-effects it produces, and as it is, therefore, difficult accurately to compare the globulin solution and the whole serum derived from different bleedings, it was decided to make a decisive test by collect-

TABLE I.—Results of Injecting the Mixed Antitoxic Horse Serum in Fifty Cases of Diphtheria Occurring in Children under Ten Years of Age.

Case.		Age in years.	Antitoxin units given.	Deleterious effects.	
				Constitutional disturbances.	Rash.
1	x	0.9	10,000 M	Marked, 5° rise of temperature.	Eighth day, general erythema lasting six days.
2		1	3,000 S	Slight	Tenth day, urticaria general.
3		1	14,000 M	High temperature, due partly to pneumonia.	Fourteenth day, urticaria lasting five days.
4	I	1.3	15,000 M	Moderate, 2° rise of temperature.	Eighth day, general erythema.
5	x	1.9	5,000 S	.....	.....
6	I	1.5	35,000 S	High temperature and marked disturbance.	Sixth day, urticaria; eighth day, general erythema of very severe type.
7	x	1.3	10,000 M	.....	.....
8	x	1.3	13,500 M	Moderate, with 1° rise of temperature.	Fourth day, severe general urticaria lasting three days.
9	x	1.6	10,000 M	Masked by pneumonia having 106° temperature.	Seventh day, severe general erythema.
10		1.7	10,000 M	Moderate, with 2° rise of temperature.	Sixth day, severe general erythema lasting three days.
11	x	1.9	10,000 M	Marked, with 3° rise of temperature.	Third day, morbilliform; eleventh day, severe general urticaria.
12		1.5	7,000 M	Slight.	Fourteenth day, erythema and urticaria general for two days.
13	x	1.5	10,000 S	Slight, with 1.5° rise of temperature.	Second day, quite severe erythema lasting one day.
14	x	2	17,900 M	Slight, with 1.5° rise of temperature.	Third day, very severe urticaria for two days.
15	x	2	10,000 M	Marked, but possibly due to sepsis.	Third day, urticaria and erythema very severe lasting fifteen days.
16		2	3,500 S	.....	.....
17	I	2.5	7,000 M	Moderate, 2° rise of temperature.	Fifth day, severe urticaria for six days.
18	x	2.5	14,000 M	Slight.	Thirteenth day, severe urticaria for three days.
19	x	2	3,000 S	Slight.	Twelfth day, general urticaria for two days.
20		2	10,000 M	Slight.	Sixth day, general urticaria for three days.
21		1.5	7,000 S	.....	.....
22		2.5	7,000 S	Extremely severe, 3°-6° for ten days.	Eighth day, morbilliform continued and intense for ten days.
23		2	7,000 S	Extremely severe, 2°-4° for one week.	Fifteenth day, morbilliform continued and intense for eight days.
24	x	2.5	8,000 S	Severe, 4° rise of temperature.	Tenth day, erythema for two days; seventeenth, second lasted six days.
25	x	2.5	7,000 M	Severe, 4° rise of temperature.	Seventh day, erythema for two days; twelfth day, second lasted five days.
26		2.8	12,500 M	Slight.	Twenty-second day, general erythema.
27	x	3	10,000 M	Severe, but possibly due to pneumonia.	Fourteenth day, erythema for five days.
28	x	3	10,000 M	.....	.....
29	I	3	8,000 M	None, except 1.50 rise of temperature.	Sixth day, urticaria for two days.
30	x	3	7,500 M	.....	.....
31	I	3	10,000 M	Severe, 5° rise of temperature for one week.	Thirteenth day, severe erythema for one week until death.
32	x	3	3,000 S	.....	.....
33	x	3	14,000 S	.....	.....
34		3	7,500 S	Severe, for ten days 4° rise of temperature.	Thirteenth day, severe erythema lasting ten days.
35		3	14,000 M	Very severe with 4°-7° rise of temperature for ten days.	Eighth day, general erythema over whole body for ten days.
36		4	3,750 S	.....	.....
37	x	4	10,000 M	.....	Twelfth day, severe erythema.
38		4	10,000 S	.....	.....
39	x	4	10,000 M	Moderate, 2° rise of temperature.	Sixth day, general erythema lasting three days.
40	x	4	5,000 S	.....	Fifth day, general erythema lasting three days.

TABLE I. (Continued.)

Case.	Age in years.	Antitoxin units given.	Deleterious effects.		
			Constitutional disturbances.	Rash.	
41	x	4	10,000 M	Marked, 4°-6° rise of temperature.	Tenth day, very severe, lasting five days until death.
42		4.5	12,000 S	.....	.....
43		5	10,000 M	Moderate, 3° rise of temperature.	Fifth day, very severe, urticaria lasting five days.
44	x	6	5,000 S	.....	.....
45		6	10,000 M	Moderate, 2° rise of temperature.	Sixth day, general erythema lasting three days.
46		7.5	7,500 M	Marked, 4° rise of temperature.	Fifth day, general erythema. Eighth day, general urticaria.
47		9	10,000 S	Slight.	.....
48	x	8	3,750 S	.....	.....
49	x	8	3,750 S	.....	.....
50	x	9	3,750 S	.....	.....
50	3.24 years average.	Average units per case 9,250	M = 28 S = 22	Thirty-five developed constitutional disturbances.	Thirty-six developed rashes.

x = intubated. I = croup. M = marked severity (of which eighteen were intubated).
S = slight severity. absent.

ing a quantity of serum from four different horses, mixing it thoroughly, and then after precipitating one-half, to treat an equal number of patients simultaneously with the whole serum and with the globulin solution. These tests were carried out chiefly in the Willard Parker Hospital, but a few also in the Riverside Hospital. We are indebted to Drs. Lynah and Watson, the resident physicians in charge of these two hospitals, for their interest and aid.

It soon became evident that the serum we had chosen for the test was of such a character that eruptions and constitutional disturbances usually appeared in those injected with the whole serum. Whether it was because the serum from four long-treated horses had been mixed, or whether because of some other reason, it is certain that this serum produced more after-effects than any lot we had used in the hospital since 1899. These after-effects were so marked and occurred in such a large proportion of the children that we had to abandon the use of the whole serum. The rashes in those given the globulin preparation were much less severe. In persons over ten years of age almost no rashes occurred after either preparation. The patients treated with the whole serum and the antitoxic globulins were most carefully watched by us and the course of the disease, as well as the after-effects, noted.

After all the tested patients had become fully convalescent or had left the hospital, the histories were finally gone over and compared. It was found that fifty children under ten years of age treated with the whole serum had lived at least nine days, or long enough for the development of serum effects. The first fifty consecutive cases

TABLE II.—Results of Injecting Refined Antitoxin (Antitoxic Globulins) Made from Serum Obtained from the same Horses and at the same Bleedings as the Antitoxic Serum Used in the Cases Given in Table I.

No.	Age.	No. units of antitoxin. Severity.	Deleterious effects due to antitoxin.	
			Constitutional disturbances.	Rash.
1	0.5	7,000 s	.....	Sixth day, moderate urticaria and erythema lasting four days.
2	0.9 x	15,000 M	.....	Second day, general erythema lasting two days.
3	1 I	10,000 M	Masked by pneumonia.	Ninth day, general erythema lasting five days until death.
4	1.5	5,000 s	.....
5	1.5 x	12,000 M	Rise of 1° of temperature.	Third day, urticaria for one day.
6	0.3 x	7,000 s	.....	Second day, general erythema for three days
7	1.5	12,000 M	.....
8	.4	3,000 s	.....
9	1.2 x	10,000 M	.....	Tenth day, urticaria lasting four days
10	1.2	15,000 M	.....	Eighth day, urticaria lasting two days.
11	1.5 x	12,000 M	.....	Eighth day, urticaria, pretty severe, lasting three days.
12	1.3 x	12,000 M	.....
13	0.9	5,000 M	.....	Fourth day, erythema lasting thirty-six hours.
14	.5	7,000 M	.....
15	1.5 x	12,000 M	.....	Fifth day, urticaria for one day.
16	2	10,000 M	.....
17	2 I	12,000 M	.....
18	2 I	10,000 M	.....	Seventh day, mild urticaria for one day.
19	2 I	12,000 s	.....
20	2	24,000 M	.....
21	2 I	7,000 s	.....
22	2	7,000 s	.....
23	2 x	10,000 s	Masked by pneumonia.	Thirteenth day, general erythema lasting three days.
24	2	10,000 M	.....	Tenth day, general erythema lasting three days.
25	2.5 x	12,000 M	Rise of 1° of temperature.	Fifth day, urticaria, then erythema—together lasting five days.
26	2.5 x	12,000 M	Rise of 3° of temperature for twelve hours, then normal.	Seventh day, urticaria for two days.
27	3 x	17,000 M	.....
28	3 x	10,000 M	.....	Eleventh day, erythema for two days.
29	3 I	12,000 M	.....	[days.
30	3 x	20,000 M	.....	Sixth day, urticaria lasting two days.
31	3 x	12,000 M	.....	Second day, slight general erythema lasting twenty-four hours.
32	4	7,000 s	.....	Sixth day, urticaria lasting two days.
33	4.5 x	8,000 M	.....
34	4 I	12,000 s	.....
35	4.5 I	12,000 M	.....
36	4 x	12,000 M	.....
37	4	12,000 M	Rise of 2° of temperature for one day.	Eighth day, severe urticaria, traces lasting five days.
38	4	12,000 s	.....
39	5	5,000 s	.....
40	5	12,000 M	.....
41	5	3,000 s	.....
42	5	19,000 M	Rise of 2° of temperature for one day.	Sixth day, severe erythema, traces lasting seven days.
43	5.5	3,000 s	.....
44	6	10,000 s	.....
45	6	3,000 s	.....	Sixth day, urticaria and erythema for three days.
46	6	4,000 s	.....	Seventh day, urticaria for two days.
47	7 x	12,000 M	.....
48	8.5 x	24,000 M	.....
49	9	7,000 s	.....
50	9	3,500 s	.....
50	3.18 years average.	10,600 units average injections.	M 31 S 19 Constitutional disturbances, 5; possibly 7.	Rashes in 23.

x intubated I croup. M marked severity. s slight severity. absent. Of the fifty there were thirty-one of marked severity; eighteen of these were intubated.

TABLE III.—Comparative Table Giving a Summary of the Constitutional and Local Reactions Obtained in the Treatment of Fifty Cases of Diphtheria in Young Children with a Lot of Antitoxic Serum Derived from Four Horses and of an Equal Number of Similar Cases Treated with a Solution of the Antitoxic Globulins Derived from a Portion of the Same Lot of Serum.

	Children who were treated with the whole serum.	Children who were treated with the antitoxic globulins.
Marked constitutional symptoms accompanied by severe and persistent rash	28 per cent.	0 per cent.
Moderate constitutional symptoms accompanied by a well-developed erythema or urticaria	18 "	4 "
Very slight constitutional disturbance accompanied by a more or less general rash	20 "	8 "
No appreciable constitutional disturbance, but a more or less general urticaria or erythema.	4 "	34 "
No appreciable after-effects whatever	30 "	54 "

TABLE IV.—Duration of Rashes.

	Days.								Total rashes.
	1	2	3	4	5	6	7	8 and over.	
Antitoxic globulin cases	4	7	5	3	3		2	...	23
Whole serum cases	1	4	10	1	10	3	2	5	36

in children under ten years treated with the antitoxic globulins precipitated from the same lot of serum and living nine days or over were taken to compare with these. Table I gives the salient points for each case treated with the whole serum and Table II the same for those treated with the solution of antitoxic globulins. Tables III and IV summarize these points.

It is noticeable that not only were the rashes more frequent, but also much more persistent in the patients who received the whole serum. Twenty-three rashes following the use of the whole serum lasted over three days in this series, as against only six in the antitoxic globulin cases.

SUMMARY AND CONCLUSIONS. The results obtained in these series of one hundred cases are so definite that it seems safe to conclude that the removal of a considerable portion of the non-antitoxic globulins, as well as the albumins from the serum by the Gibson method, has eliminated much of the deleterious matter from the serum, so that severe rashes, joint complications, fever, and other constitutional disturbances are less likely to occur from the antitoxic globulins than from the antitoxic serum from which it was obtained. The globulin preparation when tested by animal experiments appears to retain all the antitoxic properties of the whole serum. The portion of the globulins still accompanying the antitoxin in the Gibson preparation is shown to be capable of exciting rashes and

occasionally constitutional disturbances, although, as stated above, to a less extent than the serum. It is almost certain that methods will be devised to refine antitoxin still farther, and so possibly eliminate all appreciable deleterious effects of the antitoxic serum.

Whether this globulin solution will be much less likely than the serum to cause collapse in the rare cases of peculiar susceptibility, such as in a certain percentage of those suffering from status lymphaticus, is still undetermined. It has now been used in several thousand cases of diphtheria without accident.

The concentration of antitoxin made possible by the elimination of the non-antitoxic substances is not only a convenience, but of distinct clinical importance, as it tends to encourage large doses.

The antitoxic globulin solution, like the serum, tends to become slightly cloudy when kept at moderate or high temperature, and substances such as solutions of carbolic acid and trikresol are especially likely to cause a precipitate to develop. The antitoxin in the globulin preparation retains its potency about as long as that in the whole serum.

THE RELATION OF HODGKIN'S DISEASE TO LYMPHOSARCOMA.

By HENRY WALTER GIBBONS, B.S., M.D.,

ASSISTANT IN PATHOLOGY, COOPER MEDICAL COLLEGE, SAN FRANCISCO, CALIFORNIA.

(From the Pathological Laboratory of Cooper Medical College, San Francisco, California.)

GREAT confusion has existed since enlarged lymph nodes were first studied, as to the exact relationship between Hodgkin's disease, leukemia, malignant neoplasms, tuberculosis, and syphilis. Hence, a variety of names have been introduced into literature, implying a relationship to one or the other of these, which have led only to more confusion, two authors describing the same condition under different names or different conditions under the same names. Therefore, we have lymphoma (Wunderlich¹ and Ranvier), Hodgkin's disease (Wilks²), lymphosarcoma (sarcoma lymphomatodes) (Virchow³), malignant lymphoma (Billroth⁴), pseudoleukemia (Cohnheim⁵), and adénie (Trousseau⁶ and other French authors).

In order to make clear the terms used in this paper I shall define them according to the most generally accepted views at the present time. By Hodgkin's disease is meant a constitutional disorder

¹ Archiv. f. Physiol. Heilk., 1858, Band xvii, p. 123; also Archiv. f. Heilk., 1866, p. 531.

² Guy's Hosp. Rep., 1865, xi, p. 56.

³ Die krankhaften Geschwülste, Berlin, 1864, Band ii, p. 728.

⁴ Gen. Surg. Path. and Therap., 1869 (translation of fourth German edition).

⁵ Virchow's Archiv., 1865, Band xxxiii, p. 451.

⁶ Clinique Med., 1865, tome iii, p. 555.

accompanied by enlargement of the lymph glands and the lymph-adenoid tissue in various organs, which enlargements remain discrete, with clinical manifestations of great increase in size of all or some of the lymph glands, enlargement of the spleen, fever of uncertain type, marked secondary anemia, no leukocytosis, and severe cachexia, resulting in death. By lymphosarcoma is meant a growth originating in lymphoid tissue which may or may not be accompanied by enlargement of other lymph glands, which does not remain confined to the lymphoid tissue, and which infiltrates and destroys surrounding tissue.

My object in this study has been to endeavor to determine the relationship between Hodgkin's disease, as defined by Dorothy Reed¹ and seconded by Longcope² and Simmons,³ and malignant growths. I have studied nine cases, six of which correspond in most respects to the cases of these observers; while three, although showing the same clinical picture and the exact histological structure as did their cases and as do the other six of my cases, show also an undoubted malignant character, by affecting not alone lymphoid tissue, but infiltrating and destroying adjacent structures.

The disease occurs more frequently in males than in females. Of my nine cases one was in a boy of eleven years, one in a man of sixty-five, while the others were in men between thirty-three and forty. An exciting causative agent has never been conclusively demonstrated. Many bacteria have been assigned this duty, but there has been such a variety isolated from the lesions as to preclude the idea that any one is the specific cause. Fischer⁴ in twelve cases, found cultures from the blood and glands sterile.

For the last twenty years many authors have advocated the view that Hodgkin's disease is a peculiar condition due to infection with the tubercle bacillus. Delafield,⁵ in 1887, Weishaupt,⁶ and others described cases simulating tuberculosis. Sternberg⁷ in 1898, reported thirteen cases in which eight showed signs of tuberculosis, but the careful work of Fischer, in 1897, and of Reed, Longcope, and Simmons, in the last two years, has practically proved that tuberculosis and Hodgkin's disease are separate entities, though the one may be superimposed upon the other.

Benda,⁸ in 1904, advocated the view that the disease is not produced by a specific infectious agent, but by modified or attenuated toxins of several infectious agents.

¹ Johns Hopkins Hospital Reports, vol. x, p. 133.

² Bulletin of Ayer Clinical Laboratory, October, 1903, No. 1.

³ Jour. Medical Research, 1903, iv, 378.

⁴ Arch. f. klin. Chir., 1897, Band iv, p. 467.

⁵ Medical Record, 1887, 1, 424.

⁶ Pseudoleuk. u. Tuberculose, 1891, Inaug. Dissert., Tübingen.

⁷ Zeitschrift f. Heilkunde, 1898, Band xix, p. 21, and Centralblatt f. d. Grenzgebiete d. Med. u. Chir., 1899, Band ii, pp. 641, 711, 770, 813, and 847. Lubarsch and Ostertag, Ergebnisse, 1903, ix, 302.

⁸ Transact. Deut. Path. Gesellschaft, 1904, vii, p. 123.

Of my nine cases, six came to autopsy, and I had opportunity to study the organs of five; of the others, portions of the tumors only. Of the five, all showed an involvement of lymph-glands all over the body, with metastases in the liver in four, in the spleen in four, in the kidney in two, in the lungs, pericardium, pancreas, in one, each. Of the other four, one showed involvement of all the external glands and of the retroperitoneal; two of the cervicals and axillary; and one of the cervicals, supraclavicular, and mental. In five, the spleen was markedly enlarged, in one it was not palpable, in four it was not recorded. In five the glands were discrete, elastic, and easily movable; in one the cervicals were firmly attached to the fascia. In one was a tumor originating in the thymus gland and spreading by direct involvement to the pericardium and left lung, with metastases in the lymph glands, lower lobe of the lung, spleen, and liver. In two there was a large adherent tumor mass of the neck which involved the surrounding structures, fascia and muscles; and in one, part of a cervical vertebra and the wall of the jugular vein which passed through the tumor. In all of these, both in the infiltrating tumors, lymph glands, and visceral metastases, the macroscopic and microscopic appearance was practically identical, the variations being due to difference in the stage of development or rate of growth. In six of the cases the first sign of enlargement appeared on one side of the neck, in one, on both sides simultaneously, while in two it was not stated. In four of the cases the enlarged glands were removed by operation, and in all there was a recurrence after a few weeks.

The duration of the disease is agreed to be usually from three months to three years, though one of Dr. Reed's patients lived seven and a half years. One of my patients lived three and a half, two over one and a half years, but all the rest died in from three to ten months after the first symptoms appeared.

The disease runs a fairly typical course to the end, which is always death. It begins by an enlargement of one or two sets of lymph nodes, most often the cervical, which gradually extends by continuity to involve successively those of the whole body. In some cases only one or two sets may be affected, as in a case of Longcope's, in which the retroperitoneal and bronchial sets alone were involved, and in one of my cases (IX), in which only the cervicals were enlarged. The spleen is usually enlarged. There is seldom any pain in the swellings themselves, but the symptoms are often produced by pressure of the tumor masses, as in Case IX, in which the tumor pressing on the pharynx caused difficulty in breathing and swallowing, and oedema of the face and neck, and in Cases I and IV, in which there was oedema of the lower extremities from pressure on the vessels.

When the glands begin to enlarge the patient usually notices no impairment in health; but as the growths progress, there is a

more or less rapid loss in weight and in strength, an increasing cachexia, and secondary anemia. The blood picture is normal at first, later showing a gradually increasing secondary anemia, with no relative change in the leukocytes (Case I). Sometimes there may be a transient leukocytosis or a terminal increase, but these can be explained by intercurrent infections, as in Case VIII. In our cases the blood of six showed practically normal leukocyte counts, with growing anemia in one and more or less secondary anemia in the others.

Moderate fever is often noticed. It may be slight and constant or marked and irregular. A good many cases have been reported in which it showed a markedly remittent character, resembling that of remittent malarial fever or Malta fever—as occurred in one of our cases (Case I). This at one time was thought to be characteristic of the disease, but so much variance has been noted in different cases that no certain character can be assigned to the fever.

The diagnosis is easily made from true leukemia by the absence of the excessive number of leukocytes peculiar to that disease, with the exception of those cases of leukemia in which there is no marked leukocytosis. (In such instances a differential count would probably clear up the matter; see Blumer.¹) From tuberculous adenitis the diagnosis is not so easy. In advanced cases the picture is typical, but when the glands are just beginning to enlarge it is almost impossible to separate the two clinically in some instances. If a gland be removed and examined microscopically the difference is easily made out.

THE TUMORS. The lymph glands in all my cases showed much the same appearance and corresponded closely to those described by most writers. They were usually round or bean-shaped, with definite capsule, and in the large masses remained for the most part separate, though the glands were frequently connected by pedicles from the pulp. In two of the cases, however, in which the large infiltrating tumors of the neck existed, while such discrete glands were present in the periphery of the tumor mass, the growth itself seemed to be composed of a large number of glands which had coalesced. Through it ran thick bands of connective tissue, probably the remains of the old capsules. The surface presented an irregular nodular appearance, as of glands with capsules on the outside, which had fused together on the other side. No capsule could be distinguished in places, and here the tumor infiltrated and destroyed the fascia, sternomastoid and other muscles, and the salivary glands. In one case the tumor mass extending down through the upper aperture of the thorax surrounded and infiltrated the wall of the jugular vein. In the case in which the tumor originated in the thymus gland it showed a coarsely lobulated surface covered with a smooth, fibrous capsule; though where it infiltrated the lung and pericardium there was no capsule, but the nodules were surrounded directly

¹ Loc. cit.

by the tissues of the organs. The enlarged cervical, mediastinal, and retroperitoneal glands, and those about the pancreas and spleen presented the same appearance as the glands in the other cases.

The lymph glands vary in size from 1 or 2 mm. to 5 or 6 cm., and vary greatly in consistency. In three of my cases (II, III, and IV) they were extremely soft and elastic, yet solid, having shown clinically a rapid growth. In other cases they were quite hard and firm (Cases I and V), having shown clinically a more chronic course. In Case IX the tumor showed necroses and liquefaction in the centre, but the glandular masses about it, though extremely soft, were solid.

On cut surface all the glands and tumors showed the same general character—a prevailing grayish white, with yellowish bands running irregularly from the capsule so as to cut the surface unevenly. These bands were harder than the grayish tissue between them which protruded above. In the softer glands (Case IV) the surface was uniform, showing no bands, and was a very light, moist, glistening gray, protruding far beyond the capsule. In the harder ones the surface was less moist and of a dull color, while whitish areas protruded beyond the bands.

In some of the glands (Cases IV and IX) small yellowish opaque areas of necrosis appeared, and in several small hemorrhagic areas were seen (Cases IV and IX).

The metastases in the various organs presented similar appearances. They varied from pin-point masses to those 1 cm. in diameter. They were sharply outlined, without capsule, and on the cut surface similar to that of the lymph glands. They were very irregular in contour. In the liver, lying in the periportal connective tissue, they grew irregularly therefrom. In the spleen they seemed to originate in the Malpighian bodies.

MICROSCOPIC EXAMINATION. In all the cases the growths showed some stage of the same process, and corresponded closely with those recently studied by Reed, Longcope, and Simmons. In the early stages a proliferation of the cellular elements takes place rapidly. The histological structure of the gland may still be apparent, but the follicles are enlarged and the lymph sinuses plugged with cells. There are evidently three sources of this proliferation: (1) From the germinal centres of the follicles, (2) from the endothelium lining the sinuses; and (3) from the fibrous tissue of the reticulum, capsule, and bloodvessels. The lymphocytes are mostly of the variety found at the centres of normal follicles, with a somewhat larger and less densely staining nucleus than the ordinary variety. The endothelial cells in proliferating form large masses of cells of epithelioid character completely filling and distending the sinuses. Many of these show karyokinetic figures. Among these cells are seen large ones of the same character, with one, and often with several large, clear, vesicular nuclei, arrayed at the centre

or unequally distributed in the rather dense, finely granular protoplasm. Reed has traced the development of these giant cells from the proliferating endothelium; and, from their position and appearance, my work would seem to confirm this view. The reticulum gradually becomes increased in amount and thickness, but only in the later stages is it marked. In this early stage there are many fibroblasts derived from the connective tissue. Eosinophiles are often seen in large numbers and occasionally a polymorphonuclear leukocyte and a plasma cell.

The proliferation may go on simultaneously from the three sources or one may outstrip the others. In two of the cases (III) and IV which showed rapid growth, the lymphocytes of recent type predominate and only here and there can an epithelioid cell or a giant cell be seen; whereas in another case (Case II) of even more rapid development, the epithelioid cells show most marked proliferation, and the sinuses appear as great light bands between the lymphoid nodules, in which no cell division can be distinguished among the large oval clear nuclei. The numerous mitotic figures are evidence of the rapid nuclear proliferation. These areas of syncytium have been described by Weishaupt,¹ and observed by Longcope in one of his cases.

These changes represent the soft variety of Hodgkin's disease; but, as the process continues, the growth of connective tissue takes place at the expense of the other cells. The reticulum is increased so that the cells seem held in a fibrous meshwork, while the large bands of connective tissue growing from the capsule, the old trabeculae or the bloodvessels, traverse the pulp in various directions, dividing the gland into lobules of unequal size—which, as the disease advances, may occupy more area than the cells which are crowded together in little islets. From the proliferating reticular cells arise a variety of giant cells other than the ones described, which have six to ten small, rather deeply stained, oval nuclei arranged peripherally in the cells. Virchow first described these and Ribbert² traced their origin to the fusion of connective tissue and endothelial cells. He demonstrated their formation in experimental inflammation of the lymph glands in guinea pigs. They occur quite frequently in my cases and resemble in some respects Langhans' giant cells of tuberculosis and syphilis, but are easily distinguished from them. The structure of the normal gland is entirely lost in this later stage and the cells bear no particular relation to previous position of follicles or sinuses. The lymphocytes of the ordinary small variety are most numerous, many large epithelioid cells and characteristic giant cells are present, and in some cases numerous eosinophiles and some polymorphonuclear cells, but all of these

¹ *Arbt. aus dem Gebiete der path. Anat. u. Bact. aus dem path. Anat. Ints. z. Tübingen*, 1891 and 1892, Band i, p. 194.

² *Ziegler's Beiträge*, 1899, Band, vi, p. 187.

are scattered irregularly through the rather dense reticulum. Dr. Reed states that the capsule of the glands usually shows no change, except possibly some thickening. To this, from the study of my cases, I cannot agree. The capsules in all of my cases show infiltration, first with a few lymphocytes in a row between bands of the widened capsule, then as nodules with the typical histological picture of the disease. In three of my cases (II, III, and IV) I saw the tumor mass breaking through the capsule and forming a large mass on the outside, which in turn was walled off by a secondary capsule. So that the capsule of the large gland as we see it now is by no means the original one stretched out, but a composite capsule formed by secondary envelopes which have grown to wall off outgrowths from the gland which have destroyed and broken through the original capsule. This explains the thick bands which divide so many of the glands into flat concentric sections, for many of these bands are seen to be in direct continuity with the original capsule. And it explains, I think, the small collections of cells outside the capsule which Longcope took for a regenerative process by which new glands were formed to assume the function lost by the diseased glands, which were in their turn only to be attacked by the process. Probably in some part of his specimen he would find that these small collections had a connection through the capsule with the already diseased gland.

In a lymph gland of Case II this was shown very beautifully. The gland was one of recent change, follicles and lymph spaces could be made out, the capsule was much thickened, and the lower layers much infiltrated with tumor; while, in one place, a stalk of the tumor extended through the capsule connecting with a small tumor mass outside which had a thin connective tissue envelop united at both sides with the original capsule of the gland.

In one of the cases (IX) in which the nodes in the centre of a mass of enlarged glands of the neck were fused together into a soft nodular tumor, a section showed the direct infiltration of a muscle, and the cells were pushing their way into and between the muscle cells, destroying them. In another place this tumor was seen surrounding and growing into the submaxillary salivary gland.

In the interior of thick connective tissue bands the tissue often showed a hyaline change (Cases V and VI); often connective-tissue cells and cells in the centres of cellular areas showed fatty change (Case V); and necroses were quite common.

The metastases in the viscera always presented the same histological picture as the lymph glands. They evidently begin as small collections of lymphocytes and proliferating connective tissue-cells which rapidly increase and assume the characteristic structure. They seem to arise in the vicinity of bloodvessels, as in the liver, the smallest ones are in the periportal connective tissue, spreading from there so as to coalesce into large irregular masses. In three

of my cases with metastases in the liver and general enlargement of the lymph glands the tumor was seen to be infiltrating the wall of a vein and protruding into its lumen (Cases I, II, and III). The boundaries of the growths are usually rather sharply defined, but without capsule; in places they can be seen growing between the liver cells, destroying them.

In the spleen the nodes appear more frequently in the Malpighian bodies and stretch out in ill-defined nodules into the surrounding pulp. The whole spleen shows an increase in the reticulum and a hyperemia; necrotic infarctions are quite common.

In the case in which the lung was affected, metastases showed plainly that they were not alone developments of pre-existing lymphoid tissue in the organ, but progressed as true malignant metastases by pushing the tumor structure already formed into adjacent tissue, destroying them, and occupying their places, while large nodular metastases occurred in the lower lobe removed from the invading part of the tumor and not in the vicinity of the bronchi—that is, in a situation where no lymphoid tissue exists normally.

DISCUSSION ON THE NATURE OF THE PROCESS. Two possibilities as to the nature of the process are apparent, viz., is it a malignant, or is it an infectious process of the character of a granuloma? Most recent writers are inclined to the latter view. Reed is most insistent. Fischer, Clark,¹ and Simmons also hold this view. Longcope seconds it, though guardedly. Recent German publications also favor this view. Yamasaki,² regards the condition as a granuloma not of tuberculous but of unknown origin, which, however, may end in sarcoma. Wamecke,³ although he has clearly recognized that lymphosarcoma cannot be separated from Hodgkin's disease, still adheres to this conception. From the study of my cases I incline strongly to the malignant theory. The points leading these authors to accept the infectious theory may be listed as follows:

1. The clinical picture. The disease may run an acute or a chronic course, accompanied by fever.
2. The frequency with which the disease starts in the cervical glands, suggesting an infection from the throat or skin.
3. It may remain quiet, then break out suddenly and cause death.
4. One tissue, the lymphoid, only is affected.
5. The mode of spread from affected glands to those nearest it.
6. Final stage of cachexia, diarrhoea, hemorrhages, etc.
7. Beneficial effects of arsenic in the treatment.
8. Histological appearance of the growth resembles that of an infectious process.

¹ British Medical Journal, 1901, ii, p. 701.

² Zeitschr f. Heilk., 1904, p. 269.

³ Mitt. aus den Grenzgeb., 1905, xiv, 275.

9. The lack of infiltration of the capsule and surrounding tissues.

10. Metastases are caused not by cellular transplantation, but by proliferation of pre-existing lymphoid tissue apparently anywhere in the body.

It will be seen at once that many of these facts belong to malignant tumors as well as to infectious processes. We may have a rapidly growing sarcoma or we may have a slow one. We may have it accompanied by fever or we may not; and the fact that the fever of Hodgkin's disease is so variable in character, and sometimes not present at all, rather argues that it is not one produced by a definite infection. We see sarcomas which have existed for a long time, suddenly assume a very much accelerated growth. The mode of spread from diseased glands to adjacent ones is equally characteristic of malignant growths and of infectious diseases. The final stage of anemia, cachexia, and disturbances of the body functions is very characteristic of the last stages of all malignant growths.

That arsenic benefits the sufferers of the disease to any great extent is questionable; it never has cured. Everyone recognizes that there are periods of quiescence in the disease and even periods when the glands grow smaller, and this even when arsenic is not administered. The experiences of Köbner¹ and Lassar also show that arsenic has at times a decidedly beneficial influence in cases of malignant tumors.

That the metastases always start by a growth in pre-existing lymphoid tissue in the organs is not conclusively proved. In one of my cases it certainly was not the case, for a direct involvement took place from the tumor in the lymphoid tissue through the pleura and into the lung, with no regard to the situation of lymphoid tissue.

That infiltration of the capsule of the lymph glands occurred in all my cases, that in five cases the tumor showed undoubted extension through the capsule, and that in two cases involvement of muscle, salivary glands, and fascia occurred are clear evidences of malignancy. The recurrence after being removed in four cases is another suggestive fact.

In the liver of three of the cases (Cases I, II, and III) the tumor was observed invading the walls of a vein and passing through it. This was also noted once in the jugular vein. Reed observed this in the liver of one of her cases, and Longcope in the spleen of one of his.

Three of the cases were undoubtedly malignant, infiltrating and destroying surrounding structures as does any malignant growth. The only question that remains is, Can these be classed with

¹ Berl. klin. Woch., 1883.

Hodgkin's disease, or are they different and to be classed as lymphosarcoma? Osler¹ asserts that infiltration of the lung, as took place in one of my cases, does not occur in Hodgkin's disease, and that when such an infiltration does take place the disease is true lymphosarcoma. But in the light of the fact that this case, as well as the two other malignant tumors of the neck, present the same clinical features and the exact histological picture as the twenty-three cases so carefully studied by Reed, Longcope, and Simmons, and as the other six of my series, they must also be regarded as the same morbid condition. This being established, there would be no question as to the malignant character of Hodgkin's disease.

It is asserted by those who hold the infectious theory that this typical histological structure has more the appearance of an inflammatory change than that of a malignant growth. This appears to me not to be the case. The tumors resemble markedly in many respects true sarcomas. The irregularity of arrangement; the connective-tissue stroma, which so often occurs in other sarcomas, and similarly bears a very intimate relation to the cellular elements, forming a heavier connective tissue framework and a more delicate reticulum of thin fibers, which run between the individual cells; the large number of mitotic figures, evidence of a rapid proliferation of the cells, which are developed at the site and not in a great measure attracted there; and the peculiar forms of giant cells which bear more resemblance to those of sarcoma than to any found in inflammatory processes, all present a picture very suggestive of malignant growth, quite distinct from the different forms of infectious granulomas.

In suggesting a name for the disease I would agree with the recent German writers and preserve the term Hodgkin's disease.

I should reject pseudoleukemia as implying a relation to leukemia which is by no means proved. Lymphoma is too broad a term, for there are several forms of lymphoma. Malignant lymphoma and multiple sarcoma, implying a malignant character, although I believe it, cannot be accepted until more work has been done upon the subject.

I should reserve aleukemic lymphoma for a form of lymphoid tumors resembling those of true leukemia, but without the blood picture of that disease; these have been described by Blumer,² and others.

Six of my cases were clinically Hodgkin's disease, two were clinically malignant tumors, while one was on the border-line between the two. But as the lesions of all showed the same histological structure, I regard them as phases of the same morbid process. However, in view of the fact that clinically there is considerable difference between the extreme types it might still be advisable

¹ Quoted by Hare, *Practice of Medicine*, 1905, p. 775.

² *Albany Medical Annals*, April, 1905.

to retain for them the usual names: Hodgkin's disease and lymphosarcoma, respectively; always bearing in mind, however, that histologically there is no difference and that they are connected by transitional forms.

In conclusion:

1. I agree with Reed, Longcope, and Simmons as to the histological picture presented by the tissues in Hodgkin's disease, but I do not agree that it is necessarily due to an inflammatory process.

2. I assert that, in most cases, infiltration of the capsule of the diseased glands can be observed; in many cases an extension beyond the capsule occurs, and in some cases very evident infiltration of adjacent structures.

3. The study leads me to believe that Hodgkin's disease is a process to be classified with malignant tumors.

The subject of this paper was suggested to me by Dr. Wm. Ophuls, who noticed a similarity in the histological structure between several cases of Hodgkin's disease and of so-called lymphosarcoma, which he had examined in the laboratory of Cooper Medical College. I am also indebted to him for the use of his material and for most valuable guidance in my work. I am also indebted for the use of their cases, and of clinical notes, to Dr. Emmet Rixford, Dr. J. O. Hirschfelder, Dr. Coffee, and for the autopsy report of one case to Dr. A. E. Taylor.

No attempt has been made to go deeply into the literature of the subject and among the vast number of articles which have appeared upon the subject, only a comparatively few have been mentioned.

SUMMARY OF CASES.

CASE I. (Clinical report in *Occidental Medical Times*, January, 1904.)—Male aged thirty-eight years; native of Italy; varnisher. History of "chills and fever" at periods for three years. From September to December, 1903, three exacerbations of temperature (99° to 105.5°), lasting three to eight days, followed by apyretic (96° to 98°) periods of fourteen to twenty-three days. Blood was normal except for gradual decrease in hemoglobin and a number of red blood corpuscles. Gradual enlargement of all lymph glands, beginning with cervical. Spleen and liver enlarged. Died August, 1904. *Autopsy*: Hodgkin's disease with metastasis in the cervical, axillary, left epitrochlear, right femoral, mediastinal, peribronchial lymph glands, liver and spleen. Glands soft, cut surface white with yellow spots, sections show capsule composed of many fibrous bands including cells, inner bands infiltrated with tumor. Connective-tissue bands through pulp enclosing lymphocytes, epithelioid cells, and a few characteristic giant cells. Nodules in liver and spleen the same. In liver wall of the vein infiltrated with tumor.

CASE II.—Entered Hospital February 13, 1902. Died February 18, 1902. Man, aged thirty-three years; single; upholsterer. First symptoms one month before admission. Loss of appetite, weight, and strength. Gradual enlargement of glands in neck, axilla, and groin. Liver and spleen enlarged. No temperature. Blood, slight anemia. Urine negative. *Autopsy:* Hodgkin's disease, with metastases in liver, pancreas, kidneys, spleen, and enlargement of cervical, intraclavicular, left femoral, left axillary, peribronchial, and retroperitoneal lymph glands. Lymph glands and metastases show the same microscopic and macroscopic appearance. Tissue soft, and shows rapid growth with many new lymph cells. Few giant cells and masses of epithelioid cells. Little connective tissue. Capsule of glands infiltrated and tumor mass pushing through capsule. Wall of vein in liver destroyed by infiltrating tumor cells.

CASE III.—(Clinical report in *Occidental Medical Times*, vol. xvii, p. 443.)—Male, aged forty-three years; single. Eight months before death cervical glands began to enlarge, following severe cold. Followed by successive rapid enlargement of glands all over body. Enlargement of liver and spleen. Rapid loss of weight and strength. Blood showed secondary anemia, otherwise normal. Urine negative. Died October 27, 1903. *Autopsy:* Hodgkin's disease with enlargement of cervical, axillary, inguinal, saphenous, mediastinal, and retroperitoneal lymph glands. Metastases in liver, spleen, and kidney. Lymph glands are soft and on section show recent rapid growth with very little connective tissue. Many lymphocytes and few epithelioid giant cells. Capsule infiltrated and containing masses of tumor cells. Vein in liver shows destruction of wall by advancing tumor.

CASE IV.—A. M. C., man, aged sixty-five years; millwright. In December, 1903, right cervical glands began to enlarge gradually. Reached size of orange and were removed, February, 1904. In one month growth returned and was followed by successive, rapid, enormous enlargement of all external glands. Glands from axillæ removed September 13, 1904. Liver and spleen not enlarged. Died September 28. Glands in the axilla form a mass the size of two fists; glands size of walnut, soft, grayish-white; for most part separate. Some joined by connections of pulp. Cut surface uniform. Pulp bulges from capsule. Section shows similar structure to Case III.

CASE V.—A. W., boy, aged eleven years. In October, 1900, noticed a number of small swellings on right side of neck. These increased in size and number until October, 1901, when ten glands were removed. Four months later recurrence took place accompanied by similar growth on left side and in axillæ; all were again removed. Nine months later recurrence had again taken place and glands were a third time removed from neck, and boy was lost track of. Glands very hard, discrete, largest 2 cm. in diameter, pulp yellowish, crossed by white bands. Capsule very thick. Section shows thick bands

of dense connective tissue travelling from capsule through pulp with areas of cellular elements between. Histology of gland entirely destroyed. Capsule consists of dense connective-tissue bands with tumor cells between; lower layers infiltrated by cells. Several areas of necrosis.

CASE VI.—C. B., man, aged thirty-four years; native of Ireland; police officer. About January, 1900, small swellings appeared on both sides of neck; a few months later appeared in left axilla. Gradually became the size of an apple and were all removed October, 1900. In three months there was a recurrence, and patient died a year later with all superficial glands and spleen much enlarged. Glands rather hard, show slow growth, with much connective tissue and islands of cellular elements. Many giant cells, marked infiltration of capsule.

CASE VII.—Clinical notes not available, but symptoms were those of Hodgkin's disease. *Autopsy:* Hodgkin's disease with tumor in thymus gland with extension to pericardium and anterior part of left upper lobe. Numerous metastases in lungs; peribronchial, cervical, anterior and posterior mediastinal lymph glands, and in liver and spleen. Tumor, lymph glands, and metastases in organs exhibit same histological picture as in other cases, characterized by considerable connective tissue, with cellular islets containing lymphocytes, epithelioid cells, and many large characteristic giant cells.

CASE VIII.—Mr. K. In May, 1902, glands on left side of neck began to enlarge; the enlargement progressed until tumor reached size of fist and was adherent to deep structures. Submental glands and right cervical glands became involved later. Died January, 1903, of intercurrent pyemia. *Autopsy:* Hodgkin's disease with tumor involving entire left side of neck, submental, right submaxillary glands, and those about arch of aorta and in mesentery. Tumor grayish white, hard, infiltrating cervical vertebra, sternomastoid muscle, salivary glands, and passing into mediastinum infiltrating wall of jugular vein and pericardium. Tumor and lymph glands show same histological structure, bands of connective tissue including islands of cells, lymphocytes, epithelioid cells, and characteristic giant cells.

CASE IX. H. S. M., man aged forty years. Nine months before death in February, 1905, enlarged gland appeared on right side of neck, which was removed. Two months later many other tumors developed on same side and grew to enormous size. Glands on left side also enlarged. Gradual loss in weight and strength. At autopsy, tumor on right side of neck, consisting of discrete nodules on outside, tumor size of egg in centre infiltrating muscles and salivary glands, extending through upper aperture of thorax to tumor in anterior mediastinum. No metastases found in organs. Sections of tumor and glands show characteristic histological picture of fibrous type.

THE COAGULABILITY OF THE BLOOD IN YELLOW FEVER.

BY LEWIS HART MARKS, M.D.,

SUPERINTENDENT OF THE EMERGENCY (YELLOW FEVER) HOSPITAL, NEW ORLEANS.

DUE to the high degree of perfection attained in modern pathological technique, made possible by the improved microscope, by numerous specially devised accurate instruments, and by many newly created chemical stains, medical men of the last two decades have been able to establish the correctness or erroneousess of many etiological and pathological theories accepted in the past. The great majority of these antiquated theories, which were based, for the most part, on macroscopic examination alone, have been found to be grievously wanting, and these have been replaced by scientific facts. However, some of these theories, prominent among which is that of the totally lost or greatly deficient coagulability of the blood in yellow fever, still remain with us, not because they are believed, but because the finishing touches have not as yet been put to the facts that are to cause their final relegation to the domain of the historian.

The majority of the early writers believed that in yellow fever, and especially in the latter stage, the histological elements of the blood were completely destroyed, that, in the greater number of cases, the blood was always carbonized, and that its fluidity was greatly increased. From these conjectures they concluded that the power of coagulation was either completely lost or most tardily established. The following extracts have been selected from the vast amount of literature on this subject, spread out over a period extending from 1793 almost to the present day.

Dr. Rush, a Philadelphia physician, reports eleven different appearances presented by the blood of yellow fever patients in that city during the epidemics of 1793 to 1794. Three of these appearances, being pertinent to this paper, are given herewith: (1) "In the greater number of cases it (the blood) was without any separation into crassamentum (clot) and serum. (2) In some cases there was separation into crassamentum and yellow serum. (3) There was in every case in which the blood was not dissolved, or in which the second appearance, that has been mentioned, did not take place, a beautiful scarlet colored sediment in the bottom of the bowl, forming lines or a large circle. It seemed to be a tendency of the blood to dissolution."

Nassy speaks of "the fluidity of the blood."

Dr. Cathrall, in his treatise on the above epidemic (1794), remarks that "the blood, drawn in the early stage, very seldom separates into serum and crassamentum; when it does, the former is nearly of a natural color, though small in quantity in proportion to the latter."

Dr. Caldwell found in the epidemic in Philadelphia in 1805 that "the blood which flowed in hemorrhage was never capable of firm coagulation, thereby evidencing that its vitality was nearly extinguished."

La Roche¹ accounts for the hemorrhagic tendency in yellow fever thus: "The frequency of hemorrhage in yellow fever, the tendency to effusion, especially during the later stage of the disease, from the several outlets of the body, and through textures, and into parts which, in the natural state and in diseases generally, do not afford passage to blood, must depend upon a general cause, and that cause no one acquainted with yellow fever will fail to detect in the particular alteration of the blood."

Joseph Jones,² in his work on yellow fever, published in 1894, makes this statement: "In the marked diminution of fibrin we have an important explanation of the cause of the hemorrhagic tendency in yellow fever."

La Roche, in summarizing, adds: "Similar observations, as the above (those of Drs. Rush, Cathrall, Caldwell, and others), as to the fluidity and defective coagulation and dark color of the blood were made during the fever of 1820 in Philadelphia. But, on this occasion, it was discovered that, although the blood presented these appearances, and, when examined after death, was found in a fluid state, its power of coagulation was often rather tardily established than lost."

Pariset remarks on an epidemic at Barcelona in 1821: "The blood found in the cavities of the heart is black and fluid. If clots exist they are small and diffuent. The blood is apparently deprived of fibrin and no longer red. No longer separating itself into a solid part and yellowish serum. And always remaining black, carbonized, and fluid. The blood is certainly more fluid and black."

Desportes, in commenting upon the yellow fever in San Domingo, states: "The blood obtained by venesection is always very red, florid, and frothy, containing but little serum. If we bleed after the cessation of the fever the blood remains a long time in a liquid state, sometimes three or four hours after the operation, and there is no serum."

Hillary states that "in the last stages the blood is so attenuated and dissolved as to flow from different parts."

Dr. Stevens, a West Indian observer, adds to the above: "The blood found after death has the character of a dissolved fluid, nearly as thin as water, almost as black as ink, and evidently so diseased as to be totally incapable of either stimulating the heart or supporting life."

¹ *Yellow Fever considered in its Historical, Pathological, Etiological, and Therapeutical Relations*, vol. i. Philadelphia, 1855.

² *Original Investigations on the Natural History (Symptoms and Pathology) of Yellow Fever, 1851-1891*. Chicago, 1894.

Bienparthy, in 1844, gave new life to the dissolution theory by stating that under the microscope "the corpuscles disintegrated, broke down, and dissolved in the fluid plasma."

In order successfully and conclusively to refute the above statements, as to the fluidity, destruction, carbonization, and total loss of the power of coagulation of the blood, it will only be necessary to give place hereunder to the findings of contemporaneous and of later writers.

Dr. Kelly, another West Indian observer, tells us: "I have seen the blood coagulate as perfectly in yellow fever as in ordinary intermittent fever."

Henson made the following experiments in 1820: "I collected portions of blood in cups, in the course of ten to fifteen minutes it was firmly coagulated, and this was found in subsequent observations invariably to occur."

Lawson, in Jamaica, as early as 1802, examined the blood of yellow fever patients, and concluded: "This theory of disorganization has no foundation. The blood is not dissolved; on the contrary, the corpuscles appear entire and well-shaped."

Prof. Joseph Leidy, one of the most eminent scientists of the nineteenth century, stated in 1854: "I have not been able to discover the slightest evidence of the destructive process suffered by the morphological elements of the blood in this disease, as described by Bienparthy."

Sternberg¹ observed in 1879, in Cuba, that "both the red and white corpuscles retained their normal appearance, and I have frequently seen the leukocytes undergoing their characteristic movements, even after twenty-four hours, in blood which had been preserved in culture cells."

Dr. J. Crevaux, a French naval surgeon, studied the blood microscopically in French Guiana in 1877. He states clearly and definitely that he could find "no unusual alteration in the blood corpuscles."

Dr. Carlos Finlay, of Havana, in writing on this subject, in 1882, stated that "not only is the integrity of the blood corpuscles maintained in yellow fever, but their number is apparently increased during the course of the malady." Dr. Finlay believed at this early date that the hemorrhagic tendency was due to a lesion of the vascular endothelium, which he considered the characteristic lesion of yellow fever.

Dr. H. D. Schmidt,² pathologist of the Charity Hospital, New Orleans, and one of the authorities of his day on the pathology of yellow fever, concludes from his extensive experience that "it must be admitted that the condition in which its (the blood's)

¹ Yellow Fever, in Reference Handbook of the Medical Sciences, 1894, vol. viii.

² The Pathology and Treatment of Yellow Fever, Chicago, 1881.

morphological elements were found actually offers nothing remarkable or otherwise which in any way could be interpreted as peculiar or characteristic of yellow fever."

To confirm the findings of Lawson, Sternberg, Crevaux, Leidy, Finlay, and Schmidt, I might record here that in over twenty thousand examinations of fresh and stain preparations of blood of yellow fever patients made by the various workers at the Emergency Hospital in New Orleans during the epidemic of 1905 not one specimen showed the slightest evidence whatsoever of corpuscular degeneration.

The view of Finlay on the causation of the hemorrhagic tendency in yellow fever is almost proved, while the views of La Roche and Jones on this same subject are completely overthrown by Sternberg's most sensible remark, that "the hemorrhages are due to the disorganized and diffluent condition of the blood a moment's reflection should show, that this explanation is insufficient, and that the blood, however diffluent, cannot escape so long as the vessels are intact." The above statement of Sternberg is itself transformed into a fact by the knowledge which we possess to-day of the fearful damage inflicted by this disease, especially upon the smaller bloodvessels and capillaries of the various organs throughout the body.

I shall now proceed to the remaining question, of "the tardy coagulability of the blood."

La Roche after perusal of all the available literature concluded: "The inability or reluctance to coagulation, though generally exhibited, is not universal, and cases occur in which the blood coagulates with as much readiness and firmness as in other diseases."

From the works of Dr. Jones, we gather: "The following are the chief characteristics of the blood in the stage of depression in yellow fever: Specific gravity of blood and serum not specially altered. Blood coagulates slowly and imperfectly. Clot voluminous and soft. Fibrin quantity deficient and not more than one-tenth the normal amount. Reaction of blood alkaline," etc.

In order to refute the above, I shall first state briefly our macroscopic findings, and then record the results attained by actual experiments with an accurate instrument.

1. I have repeatedly seen blood drawn from the median vein of a yellow fever patient coagulate before it could be forced out of the aspirator into a receptacle held ready to receive it—the blood not remaining in the aspirator more than from three to five minutes.

2. Blood drawn from the median vein of a yellow fever patient and placed in a large test-tube alongside of another similar tube containing normal blood, drawn in the same manner, did not differ in the slightest degree from the latter, and one not knowing which was which could not so state.

3. In performing certain filtration experiments, it was found impossible to filter unaltered blood, and to overcome this readiness

to coagulate, it was necessary to add a solution of potassium oxalate to prevent rapid coagulation.

In making the actual experiments, Wright's coagulometer was used. Space will not be consumed here in describing the technique employed, as this can be found in almost any standard text-book on clinical diagnosis. However, a record must be made herewith that the heating chamber of this instrument was discarded, since the temperature prevailing in the city at the season of the year during which these tests were made was fairly constant and not sufficiently below the standard as to affect materially the results. Eight of the most typical cases of yellow fever were selected for these tests, with the following results:

In speaking of symptoms existing prior to tests, I shall only record those which are considered characteristic of the disease, and make no mention of pain, temperature, etc.

CASE I.—M. P., white, male, aged thirty-five years; nativity, France; occupation, barkeeper. One year in New Orleans. Symptoms prior to test: Injected sclera, general jaundice, spongy and bleeding gums, profuse epistaxis. Vomited at intervals large quantities of unaltered blood. Maximum amount of albumin, 13 per cent. (Purdy's method.) Bile-stained casts.

Test No. 1 on twelfth day of illness: Coagulation was negative in three minutes and thirty seconds; positive in four minutes.

Test No. 2 on fourteenth day of illness: Coagulation was negative in three minutes and thirty seconds; positive in four minutes.

CASE II.—F. W., white, male, aged forty-three years; nativity, Texas; occupation, blacksmith. Symptoms prior to test: Jaundiced sclera, gums spongy, afterward bleeding; maximum amount of albumin, 6.5 per cent.; bile-stained casts later in disease.

Test No. 1 on second day of illness: Coagulation was negative in two minutes and forty-five seconds; positive in three minutes (four tubes).

Test No. 2 on sixth day of illness: Coagulation was negative in three minutes and thirty seconds; positive in four minutes (six tubes).

CASE III.—J. S., white, male, aged twenty-three years; native of New Orleans. Symptoms prior to test: General jaundice, spongy and bleeding gums. Maximum amount of albumin—trace.

Test No. 1 on fifth day of illness: Coagulation was negative in three minutes and ten seconds; positive in four minutes (six tubes).

CASE IV.—E. J. M., white, male, aged twenty years; native of New Orleans. Occupation, boilermaker. Symptoms prior to test: Injected sclera, general jaundice, profuse epistaxis, bleeding gums, black vomit. Maximum amount of albumin, 14 per cent.; bile-stained casts.

Test No. 1 on seventh day of illness, one-half hour after black

vomit. Coagulation was negative in three minutes and ten seconds; positive in four minutes and ten seconds.

Test No. 2 on ninth day of illness: Coagulation was negative in three minutes and eleven seconds; positive in four minutes.

CASE V.—J. B., white, male, aged twenty-six years; native of New Orleans. Symptoms prior to test: General jaundice, bleeding gums, black vomit (once), slight renal suppression. Maximum amount of albumin, 5 per cent.; large number of casts, *not* bile-stained.

Test No. 1 on sixth day of illness: Coagulation was negative in three minutes and thirty seconds; positive in four minutes and twenty seconds.

CASE VI.—A. L. B., white, male, aged twenty-eight years; native of Louisiana; occupation, clerk. Symptoms prior to test: Bleeding gums, slight jaundice, injected sclera. Maximum amount of albumin, 7 per cent.; bile-stained casts.

Test No. 1 on third day of illness: Coagulation was negative in three minutes; positive in three minutes and forty-five seconds.

CASE VII.—F. A., white, male, aged twenty-one years; nativity, France; occupation, tramp. Walked into New Orleans twelve days before beginning of attack. Symptoms prior to test: Spongy gums, eyes injected. Maximum amount of albumin, 2.5 per cent. Vomited several times; unaltered blood. Large number of bile-stained casts.

Test No. 1 on eleventh day of illness: Coagulation was negative in three minutes and ten seconds; positive in four minutes.

Test No. 2 on twelfth day of illness: Coagulation was negative in three minutes and ten seconds; positive in three minutes and forty seconds.

CASE VIII.—C. L., white, male, aged thirty years; nativity, Germany. Symptoms prior to test: Marked jaundice, gums spongy and bleeding, vomited once on eighth day small amount of black vomit. Maximum amount of albumin, 4.5 per cent.; bile-stained casts.

Test No. 1 on eleventh day of illness: Coagulation was negative in three minutes; positive in three minutes and thirty seconds (five tubes).

A brief summary of the foregoing shows: Minimum time of positive coagulation, two minutes and forty-five seconds; maximum, four minutes and twenty seconds; average, three minutes and fifty-two seconds.

From these findings I can state almost without hesitancy that the coagulability of the blood in yellow fever is normal.

I acknowledge the kind direction and valuable assistance rendered me, while performing this work, by Drs. J. T. Halsey and P. E. Archinard, and many others.

UNILATERAL PARALYTIC CHOREA, WITH A REPORT OF A CASE.¹

BY JULIUS GRINKER, M.D.,

PROFESSOR OF NERVOUS AND MENTAL DISEASES, CHICAGO POST-GRADUATE MEDICAL SCHOOL;
ASSISTANT PROFESSOR OF CLINICAL NEUROLOGY, NORTHWESTERN UNIVERSITY MEDICAL
SCHOOL; NEUROLOGIST TO THE COOK COUNTY HOSPITAL, CHICAGO, ILLINOIS.

Of all nervous disorders chorea is probably the most easily diagnosed, for the reason that the symptoms are so striking and characteristic. This statement, however, applies only to the ordinary form of the disease, with the irregular muscular twitchings, the constant unrest and nervousness that are always found in a well-developed case. In the majority of instances the symptoms are so pronounced as to enable the teacher or the mother of the little patient to diagnose St. Vitus' dance even before the physician makes the diagnosis of chorea.

It is quite different, however, in the cases of chorea with ill-defined symptoms when the disease is just developing, and in the cases in which paralytic symptoms predominate over the irritative ones, viz., the jactitations and twitchings. The diagnosis is most difficult and almost impossible when the paralytic symptoms confine themselves to one side of the body and are unaccompanied by the spontaneous and inco-ordinate movements so commonly seen in chorea.

Fortunately these cases are rare, and the diagnosis can be made either by exclusion or by attention to some points ordinarily found in most cases of chorea but disregarded. It is with a view of emphasizing these that I report a rather rare case of unilateral paralytic chorea with a peculiar etiology.

As far back as 1850 the great Todd² recognized paralytic chorea, which he describes as follows: "In a large proportion of cases of chorea the choreic movements occur more on one side than on the other, and sometimes they will be altogether confined to one side—the child being hemiplegically affected. In such a case, as happens when the choreic movements have wholly or partially subsided, the limbs that were previously twitching now become paralyzed. The case now resembles in every detail that of ordinary hemiplegia from cerebral causes. But the following points of difference can usually be observed:

- "1. The face is often not affected, or slightly so.
- "2. There will not be any paralysis of the tongue, but more or less of the peculiar mode of protrusion which characterizes chorea.
- "3. The paralyzed limbs will exhibit, even in a very slight degree, the choreic movements."

¹ Read at a meeting of the Chicago Neurological Society, March, 1906.

² Clinical Lectures on Paralysis, 1850, p. 313.

Gowers¹ reports five cases of paralytic chorea in which one arm was usually more affected than the opposite one, and in which seven to fourteen years was the age of predilection. He says: "Whenever a child of this age suffers from gradual loss of power in the arm and presents no weakness in the face, tongue, or leg, the disease as far as I have seen is always chorea. If the nature of the case be suspected, confirmatory evidence—slight occasional spasm—if looked for, will commonly be at some time detected, either in the weak arm or in the other. The course of these cases is tedious, and as the choreic movements may increase as the weakness passes off, the patients often seem, to the friends, to be getting worse when really getting better. I have never seen this form pass on into severe general chorea."

Osler² says: "Muscular weakness is a prominent symptom of chorea and may result in a condition of paresis or even paralysis. It may be hemiplegic, paraplegic, or—more frequently—monoplegic. Very rarely does the loss of power reach the grade of complete paralysis, but the child may be unable to lift the arm to the head, a shoulder may droop, the grasp may be feeble, or there is wrist-drop. It is important to remember that there may be extreme paresis, with slight inco-ordination and few spontaneous movements. Weakness of the arm is shown by enfeebled grip, of the leg by a dragging or by a decided limp. The paralytic symptoms may precede or come on in the course of the attack, more rarely follow it."

The cited descriptions of paralytic chorea are certainly clear and should help one to make a diagnosis in every case. However, if the disease appears after a trauma and as a pure hemiparesis, without choreic twitchings, even the lucid description of the masters will leave us in doubt unless we also consider the points brought out by later investigators. In my opinion, O. Förster³ has given the best analysis of the motor disturbances in chorea. He divides them into (1) spontaneous choreic movements, and (2) inco-ordination of voluntary movements. But I believe we can conveniently subdivide the last heading into (a) inco-ordination proper, and (b) muscular weakness.

1. The spontaneous choreic twitchings are irregular jerks; that is, the elements of rhythm and regularity, such as are found in tremors, are always absent in true chorea. Further, the twitchings mostly occur in single muscles, or in muscle groups that do not act synergistically, as opposed to other forms of muscular movements that preferably affect entire muscle groups which constantly act in unison. The spontaneous movements of chorea never resemble a voluntary movement and seem entirely devoid of purpose.

¹ British Medical Journal, 1886, p. 636.

² Medical News, 1887, p. 466.

³ Das Wesen der Choreatischen Bewegungsstörung. Volkmann's Sammlung klin. Vorträge, October, 1901.

This distinguishes the disease from tic, in which condition movements, though involuntarily executed, have a superficial resemblance to a purposive act. The choreic twitchings may be likened to the clonic contractions in epilepsy as regards the suddenness of their occurrence. They differ, however, in the fact that there may be only one or two jerks followed by complete relaxation in chorea, while in epilepsy the clonic spasms are an accession of a series of muscular contractions upon muscles already in tonic contraction, which contractions continue for some little time and only gradually merge into relaxation.

2. (a) *Disturbances of Co-ordination.* There is a lack of promptness and instability in muscle innervation. The impulse is either delayed or side-tracked into byways instead of reaching the intended muscle paths. Or, if the intended movement is executed there are so many accessory irrelevant movements that an inco-ordinated act is the result instead of the orderly co-ordinated intentional movement of health.

(b) *Muscular weakness* results from either a delayed nerve impulse or from dissipation of well-directed energy into channels having an inhibitive effect upon the intended movement.

To summarize this analysis, we have, on the one hand, the involuntary so-called choreic spontaneous movements which depend upon an irritation of single muscles and are dissimilar to voluntary movements. On the other hand, we have disturbances of co-ordination; that is, a disturbance either in the execution of voluntary movements or in the maintenance of static equilibrium. The inco-ordination manifests itself in its complete form as follows: The principal muscles concerned in voluntary movements are promptly innervated, but the impulse is miscarried to a varying degree. In severe cases it is so ineffectual as to cause distinct paresis affecting equally all the muscles of an extremity. In the simple movements of the fingers, tongue, and lips the innervation may be delayed and intermittent.

The impulse for the so-called agonists, the muscles directly concerned in a movement, as opposed to the antagonists, which merely assist the agonists, may radiate into other channels or along the commissural tracts to the opposite side; then we have purposeless associated movements. In like manner the antagonists that support or maintain the agonists are not properly innervated in severe cases of chorea and we have intermittent muscular contractions. In a general way we may state that those impulses that are directly concerned in the volition of station or locomotion are functioning properly; in fact, there is even an excess of function leading to associated movements, while those involuntary motor impulses concerned in the maintenance of equilibration which emanate from the cerebellum and its paths are markedly deficient in chorea. This

has led Otfried Förster to formulate a theory that chorea is primarily a disease of the cerebellum or of the superior cerebellar peduncles.

We may assume with him that the toxic agents causing chorea act principally upon the cerebellar tissue and produce both irritant and paralytic effects. The irritant impulses upon the muscles are probably conducted from the cerebellum along the superior cerebellar peduncle, through the red nucleus, to be transmitted either directly into the centrifugal paths, or else to be carried up still higher through intermediate stations into the cerebrum, whence the motor impulse is transmitted in the same way as the twitchings of symptomatic chorea and epilepsy.

Whether this theory proves correct or will shortly be substituted by some other theory, it certainly explains most of the phenomena found in chorea, and particularly does it throw some light upon paralytic chorea.

A study of the various movements in chorea led Weir Mitchell and J. H. Wallace Rhein¹ to distinguish four different types:

1. Movements are continuous during the period of muscular inaction. Hands lying in patient's lap are in constant motion. But when patients perform a delicate muscular effort there is an entire disappearance of movements lasting throughout the muscular effort.

2. In this type there are clonic contractions during rest. Volition so aggravates them that a voluntary movement cannot be accomplished. There is a lessened inhibition during willed muscular effort. This is the usual type.

3. The rarest variety becomes evident when patients attempt to perform a muscular act. The hands at rest move, if at all, only slightly and at rare intervals, but on attempting to use them the twitchings become sufficiently active to prevent or greatly to interfere with the performance of the act.

4. There is a small number of cases in which the movements, continuous during rest, are but slightly altered by the tests employed.

My case showed the third type of movements during the latter part of its course.

CASE.—J. B., aged seven years, a school-boy of Irish-American parentage, was first seen by me January 12, 1906.

Family history is negative: father, mother, brother, sister, uncles, and aunts are free from nervous and mental disorders.

Patient was born in normal labor, walked and talked in proper time, never had convulsions or other nervous manifestations, and mental development showed no anomalies. Of past illnesses, he had diphtheria, followed by mumps, about a year ago, and an intestinal affection, resembling typhoid fever, about nine months ago.

¹ Philadelphia Medical Journal, 1898, p. 153.

He never had rheumatism or growing pains, nor was there an acute sore throat prior to the development of present complaint.

Present Trouble. About three and a half months ago while on his way from school a companion kicked him in the region of the right ankle. A soft swelling soon appeared over the outer malleolus and the boy began to limp. When he reached home his mother massaged the affected parts and the swelling promptly subsided, but the limping continued. Within the next few days a weakness developed in the entire right lower extremity and a few days later the right upper extremity became similarly involved. All movements with the right arm and hand became clumsy and subsequently impossible.

Four weeks after the beginning of these symptoms he came under my observation.

Examination. The patient, a healthy appearing boy of medium height and weight, is free from signs of visceral disease. His gait, however, is defective, in that he drags his right leg, resembling somewhat the polyneuritic step. The right arm hangs passively by the side and dangles somewhat when the patient walks, so that he gives one the impression of being the subject of a right-sided hemiplegia. The face shows no weakness or paralysis. The pupils are equal and respond promptly to light and accommodation.

Upon testing muscular strength a uniform diminution was found in the flexors and extensors of the upper and the lower extremity on the right side, more of a paresis than a paralysis. The grip in the left hand was good, but that of the right hand was almost nothing, despite the little patient's strenuous efforts to force up the lever of the dynamometer. Neither signs of injury nor atrophies were discoverable anywhere upon repeated examination.

The superficial and deep reflexes appeared normal on both sides, except the right knee-jerk and Achilles tap, which were slightly reduced. In eliciting the patellar reflex I found the upstroke very prompt, while the downward movement was considerably delayed bilaterally, particularly on the paretic side. Upon tapping the tendon the limb flew up promptly, then dallied a while, and came down in a zig-zag manner, continuing this rhythmic movement even after it had regained its former position. There was no spasticity on the affected side and no Babinski, Oppenheim, or Gordon signs. The tongue was protruded in a straight line and showed a few irregular twitchings. No sensory disturbances were found.

About three weeks after my first examination a slight improvement was noticed, but when the patient attempted to use his right hand and arm a peculiar jerkiness and tremor appeared, resembling partly the intention tremor of multiple sclerosis, and having some of the characteristics of tabetic inco-ordination. When directed to touch his nose with the tip of the right index finger there were several purposeless excursions in the arm, forearm, and finger, becoming

ing more exaggerated when he had almost accomplished his design. In an attempt to grip my hand with his right, at first some power was developed, which dwindled down to nothing; then alternating contraction and relaxation of muscles occurred, which could not only be felt but also seen as the tendons intermittently sprang into view. In raising his right lower extremity from the ground inco-ordinate movements developed at once and continued as long as the effort was maintained. In walking he appeared to throw out his right foot instead of using dorsal flexion. The muscular twitchings, previously barely noticeable, had become more numerous. At a subsequent visit the symptom of associated movements could also be demonstrated. When he attempted to make a fist with his left (the unaffected) hand the right participated; when he raised his left leg the right also ascended. But when the movement was initiated by any of the extremities of the right (affected) side no similar participation was indulged in by the left-sided members.

At present his paralytic symptoms are on the decline, so that he walks better and is regaining the use of his right hand. The choreic twitchings, however, have become more marked. This, according to most observers, is a favorable sign.

To summarize: We have a hemiparesis which developed after slight trauma in a previously healthy boy. The weakness began with limping, and within ten days slowly spread over the entire right half of the body with the exception of the face. The reflexes were slightly reduced on the affected side; there were no atrophies, spasticity, or sensory disturbances.

In the differential diagnosis we must consider cerebral hemiplegia, neuritis, and poliomyelitis. Against the diagnosis of cerebral hemiplegia speak the absence of spastic symptoms and the etiology. Anterior poliomyelitis can be ruled out because of the absence of atrophies. The same course can be pursued with neuritis, in which sensory disturbances are a marked feature, while they were never present in this case. We must now consider hysteria and chorea. The patient shows no ancestral or personal tendency to the great neurosis, being of sturdy Irish-American stock, and one out of six young children who are not reared in luxury and receive only the little attention that a workingman's wife can bestow upon them. The boy never showed signs of nervousness and a careful search for hysterical stigmata was negative. Even by exclusion we are forced to make the diagnosis of paralytic chorea. But how can we account for the peculiar onset of the disease with a trauma? As in all forms of trauma, we have the physical and psychical elements to reckon with. The physical element in this case was almost *nil*, a slight transient swelling over the ankle; the psychical element, the unexpected attack—the fright—precipitated the disease, as it often does in other cases of chorea. The physical trauma may have determined the beginning of the

condition at the site of its occurrence, but was of secondary importance otherwise.

As regards *treatment*, rest, tonics, and a modified form of Fränkel exercises are the only measures now employed. In the beginning I ordered arsenic in the form of Fowler's solution, which had to be discontinued because it affected the patient unfavorably. Antipyrine in five-grain doses was then substituted, with doubtful results; he then took hypophosphites, with marked benefit. By July, 1906, the patient showed great improvement; he was able to use his right hand, and the gait was very nearly normal. There was only an insignificant amount of inco-ordination in the right upper and lower extremities, and no twitchings could be observed anywhere. The course in my case is rather prolonged (since December, 1905), but, like other prolonged cases, tends toward complete recovery.

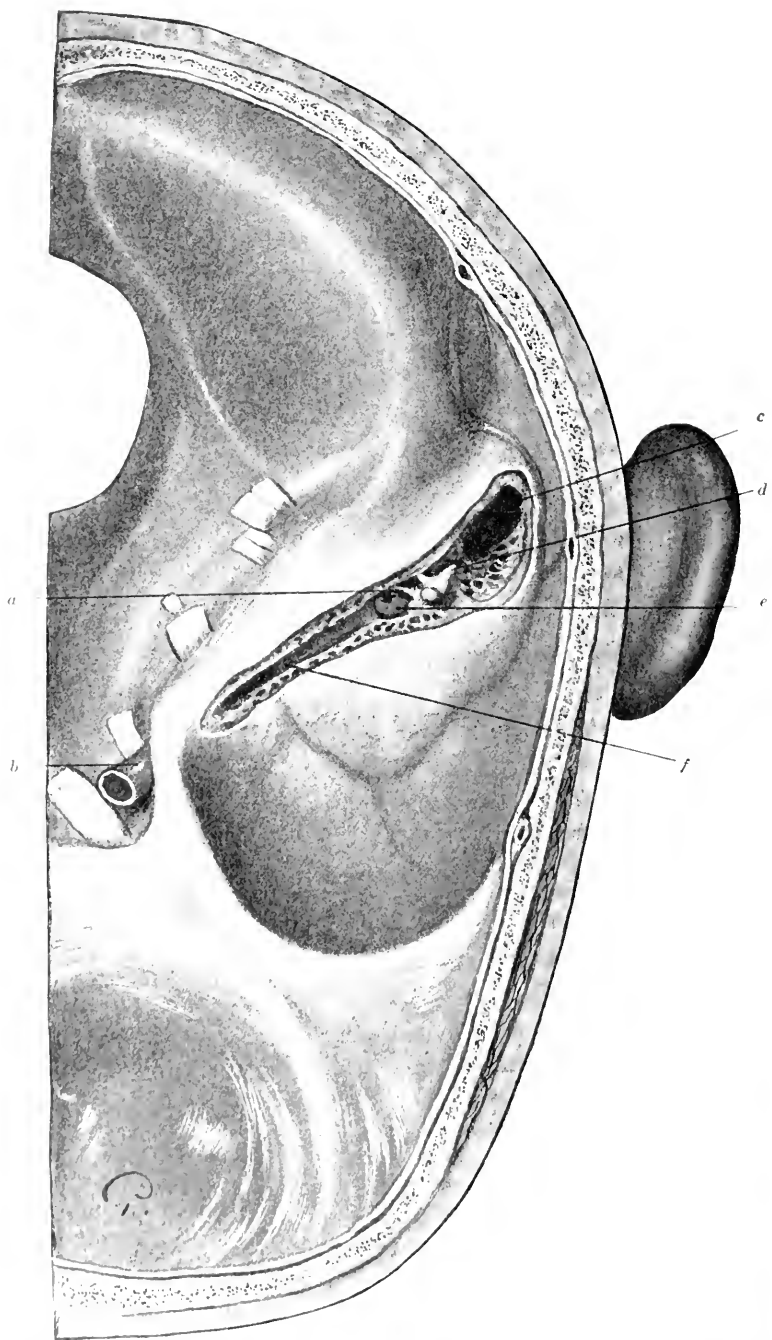
In conclusion, I wish to emphasize that associated movements should be looked for in every case of supposed chorea, that some degree of inco-ordination is almost a constant symptom in this disease, and that various degrees of muscle weakness will be found. Muscular twitchings, be they ever so few, constitute a valuable diagnostic aid. A helpful symptom in doubtful cases is the knee-jerk retarded in its descent, first studied and described by Gordon. The slow development of a paralysis in an otherwise healthy child should make us think strongly of paralytic chorea.

POSTURAL TREATMENT OF OTITIS MEDIA AND MASTOIDITIS.

By A. E. SCHMITT, M.D.,

ASSISTANT INSTRUCTOR IN OPERATIVE SURGERY, COLLEGE OF PHYSICIANS AND SURGEONS
(COLUMBIA UNIVERSITY), NEW YORK.

DURING the past few years operative procedure has become so common in otology that with many surgeons the slightest sign of involvement of the mastoid antrum complicating an otitis media is considered an indication for operative interference. A better understanding of the anatomical relations of the parts, together with the application of one of the fundamental principles of successful surgery, that is, drainage, would lead to a more conservative line of treatment in a direction that seems to have been entirely overlooked, namely, the posture of a patient with otitis media or mastoiditis. The relationship of the middle ear and antrum is such that, if an inflammatory exudate is present in the middle ear and the patient is lying on his back, the secretions will flow by gravity from the middle ear through the aditus ad antrum to the mastoid antrum itself. The presence of a secretion will, of course, irritate the membrane lining the antrum and produce mastoiditis,



Base of the skull—seen from above with the dura mater intact, except over a portion of the temporal bone where it and the bone have been cut away to expose the Eustachian tube, the tympanic cavity, the attic, aditus ad antrum, and the mastoid antrum. *a*. Long process of malleus. *b*. Carotid artery. *c*. Mastoid antrum. *d*. Short process of the incus. *e*. Tympanic membrane, with perforation. *f*. Eustachian tube.

even though the inflammation has not extended from the middle ear. Let us recall for a moment the exact relations of the parts in the tympanic cavity. (See accompanying figures.)

Anteriorly is the opening of the Eustachian tube. It is through this tube that an inflammation originating in the nose or pharynx extends and causes an involvement of the middle ear. The mucous membrane lining the tube swells and clogs this channel temporarily. The natural passage through which the middle ear is aerated and drained is closed, and the result is a retention of the inflammatory secretions within the middle ear, which aggravates the already inflamed membrane. If not relieved there is in time a bulging of the tympanic membrane accompanied by great pain, and if a paracentesis is not performed an extension to attic, aditus, and antrum occurs. If the drainage through the perforation is sufficient, the process of repair sets in and frequently the inflammation of the entire tract subsides, even though it has extended to the attic, aditus, and antrum. If pus is present, there is an erosion of the membrane which, owing to interference of the circulation from pressure, has become less resistant, and a perforation results—which gives relief from the symptoms of pressure. As far as the middle ear is concerned, the tendency now is to repair. But what happens to the antrum if it has become filled with the exudate? As these cases are now ordinarily treated, the patient is permitted either to sit erect or lie on the back, or occasionally on his side. In the recumbent position the irritating discharge remains in the antrum and causes an inflammation which, in turn, adds to the exudate, of which only the overflow leaves the antrum through the aditus.

The inflamed membrane goes on to ulceration and eventually to necrosis of the bony lining, with further involvement of efferent veins and lymph channels, infecting all the important surrounding structures and thus establishing the various complications of middle ear disease. If the mastoid process is cancellous, the extension of the inflammation to other pneumatic cells throughout the process may be very rapid. Necrosis extending backward from the antrum soon reaches the bony lining of the lateral sinus, or the inflammation may extend through the connecting veins of the sinus, producing a thrombosis of the lateral sinus, without antecedent necrosis.

Referring again to the anatomical relations, we have externally the drum membrane; internally, the bony inner wall, with exception of the membrane of the round window; above, the ossicles and the bony roof; posteriorly, a bony wall below and an opening above, that is, the aditus or passage which leads to the antrum. The position of this passage high up on the posterior wall undoubtedly in many cases prevents the inflammatory process from reaching the antrum. On the other hand, when the antrum is once involved and the patient is allowed to rest on his back, the position of the aditus in its relation to the antrum is such that the acrid secretions

are prevented from leaving the latter, and thus is produced all the trouble we are familiar with. What then can be done to relieve this apparent faulty provision of nature when inflammation ensues? This apparently faulty provision of nature is really an excellent one and finds its parallel in the accessory sinuses of the nose.

The ostea of the maxillary, frontal, and sphenoidal sinuses also are at the highest point possible and well protected, so that no extraneous matter from the inhaled air can enter and infect them. When, however, inflammation occurs, the ostea are most unfavorably situated for draining the cavities, and if relief is not given by posture they must be opened at the most dependent point. This question of drainage is the all-important factor in the successful management of these cases, and the anatomical relations point out the proper course to pursue. If the middle ear or antrum is to be drained, the patient should be placed in such a position that it will drain. And what is this position? *It is one in which the antrum is placed at a higher elevation than the middle ear, and the middle ear higher than the Eustachian tube, its natural outlet or drain.* With a patient lying face downward—the forehead and one cheek supported by pillows, the nose and mouth and one eye free—perfect drainage can be procured. When the patient is made to realize the importance and advantages of this position, he will not only assume it from necessity, but even adopt it by preference as a comfortable posture during sleep. Now, what happens in this posture?

If an otitis media alone exists, the secretion will drain through the Eustachian tube, provided it is not clogged, or through a perforation of the drum membrane, if such exists. This would prevent antrum involvement, which might have occurred if the secretion had been allowed to flow into it and be retained there. If the antrum is already inflamed, the secretion, flowing off through the aditus into the middle ear and out as before, will enable the mucous membrane lining it to proceed to repair, and erosion of it and necrosis of the underlying bone will not occur. Even though the external symptoms of pain on pressure and œdema over the mastoid process have occurred, generally these will gradually subside and disappear, and an operation with a tedious and painful after-treatment will become unnecessary.

The management of otitis media or mastoiditis is, therefore, as follows:

A purgative is given to aid in relieving the local congestion in the affected area. The rhinitis or pharyngitis, whichever may have been the causative factor in the involvement of the Eustachian tube, receives the utmost attention, the greatest efforts being directed to the Eustachian opening and nasopharynx. Following this, the tube itself is treated in order to reduce the swelling of its lining membrane, to render it patent, and thus effectually to drain the middle ear. The patient is directed to produce suction in the Eustachian

tube by swallowing water, with the nose and mouth closed, several times daily. If these measures do not suffice to relieve the condition in the middle ear without operative procedure, paracentesis of the drum membrane should be performed. Instead of the ordinary puncture of the membrane, I incise it from its midpoint (tip of long process of malleus) downward, and make a second incision posteriorly, beginning half-way up and curving downward and forward until the second and first incisions meet, thus forming a flap. This gives a larger opening than a single incision, and, besides permitting free draining, is large enough for introducing a small cannula for irrigating the middle ear. In douching the tympanic cavity in mastoiditis the stream should be directed upward and backward toward the aditus. The patient is advised to lie face downward most of the time, and occasionally upon the affected side. The Eustachian tube should be treated through the nose by means of a catheter, through which a mild antiseptic and detergent solution may be introduced; this flows out through the perforation in the drum. On the other hand, if in irrigating the tympanic cavity the Eustachian tube is patent, the solution will flow out of the nose or into the throat. For irrigating through a perforation, a thin cannula, bent at the end and attached to a rubber bulb placed at an angle permitting exact introduction by sight, should be used. The irrigations are performed by the attending physician twice daily or at longer intervals according to the stage of the process. This frees the middle ear, the aditus, and the Eustachian tube, and as soon as the secretions have diminished and drainage is sufficient through the Eustachian tube, the flap made in the drum may be allowed to fall back into place and to close the perforation, forming a perfect membrane instead of the large perforations that are liable to result from other incisions. The patient himself douches the outer ear at more frequent intervals, and retains the prone posture for the greater part of the time between treatment. Before douching, the patient is instructed to introduce a detergent and cleansing solution full strength into the outer ear to be retained for from five to ten minutes while lying on the other side.

Adrenalin, alcohol, powders, or other medicaments may be used as indicated, to hasten the process of repair. I am also in the habit of having patients take one-half gallon of some alkaline water during the twenty-four hours, as I think it thins the discharge, causes it to flow off more rapidly, and prevents accumulation and formation of crusts.

In several instances of severe otitis media and mastoiditis, in which, in the opinion of eminent otologists, it was deemed necessary to operate immediately, I have been able by this more conservative treatment to cure the condition present; and I feel that by this simple method, I have prevented many cases of otitis media from developing into operable mastoiditis. Of the measures used the postural treatment was probably the most essential.

PARALYSIS OF THE FACIAL NERVE DUE TO THE EUSTACHIAN ELECTRO-BOUGIE: REPORT OF A CASE.

BY JOHN B. SOLLEY, M.D.,

FELLOW OF THE ACADEMY OF MEDICINE, NEW YORK.

A REVIEW of the literature of electrolytic dilatation of the Eustachian tube, appearing subsequent to Duel's publication of a new method in 1897¹ and his later reports of cases² and results,³ has failed to reveal an accident similar to the subject of this paper. Nor has any mention been made of the possibility of such a complication in any of the various reports, special text-books on the ear, or in the published transactions of otological sections or societies which have been accessible. The accidents which have been experienced thus far in the procedure have been promptly ventilated, however, in the discussions of otological meetings, and by several of the few authors who have taken issue upon the method. Furthermore, in 1903 Dr. Duel asked by letter for reports upon the results of the method, if used, from some two hundred and fifty otologists, and published the information obtained.⁴ He also recently informed me that he had not heard of such a case.

Symptoms referable to irritation of the chorda tympani have been met with in a few instances. I have had two such cases, but as the lesion is distinct from the injury of the main trunk of the facial to be described, it will be reserved for a future report dealing with an experience of over two years with the method.

E. S. F., aged forty years, married, a broker, came under treatment on February 17, 1905. At that time I had employed the method, as elaborated by Dr. Duel, in some fifty selected cases in the aural clinic of Dr. Dench at the New York Eye and Ear Infirmary, and in private practice, with very favorable results, and without accidents other than the temporary irritation of the chorda tympani mentioned. The patient's family history was distinctly neurotic, but otherwise good. His personal history was negative for tuberculosis, syphilis, gout, influenza, autotoxic or infectious arthritis. He was supposed to have had smallpox when ten days old. After an attack of scarlatina in childhood, the date of which is not recalled, he distinctly remembers having the right ear syringed for some days. He had measles at sixteen;

¹ On a New Method of Dilating Strictures of the Eustachian Tube by Means of the Galvanic Current, N. Y. Med. Jour., January 16, 1897.

² The Rapid Dilatation of Strictures of the Eustachian Tube by Electrolysis, New York Eye and Ear Infirmary Reports, 1897, vol. vii.

³ The Value of Electrolytic Dilatation of the Eustachian Tube in Chronic Tubal Catarrh and Chronic Catarrhal Otitis Media, AMER. JOUR. MED. SCI., 1900, p. 426.

⁴ The Possibilities and Limitations of the Electro-bougie in the Treatment of Chronic Catarrhal Otitis, The Laryngoscope, 1903, p. 522.

otherwise no serious illness, and never any other acute inflammation of the ears. Impairment of hearing, accompanied by tinnitus in both ears, was first recognized twenty-one years ago. Inflation produced no improvement. Ten years ago ossiculectomy was performed on the right ear, relieving the tinnitus and improving the hearing temporarily. Vibratory treatment and inflation were tried four years ago without benefit. Two years ago the hearing and general health became so impaired that the patient was obliged to give up his work, and went abroad to consult foreign otologists. Vibratory treatment was advised and given by a distinguished Munich otologist, and the tubes bougied by the ordinary method, but without appreciable effect upon the hearing or tinnitus. One year ago the tubes were bougied in the usual manner in this country and were declared to be open. Since then the patient has not been under treatment.

Examination. The patient is of a highly nervous temperament; well nourished but pale. Hemoglobin (Fleischl), 80 per cent. Otherwise the general condition shows nothing significant. Mucous membranes of nose and throat congested and hypertrophic. Eustachian eminences spongy and congested. *Right Ear:* Drum thickened by irregular deposits; the tube is patent. Tone-limits, 2048-128. Bone-conduction normal. Watch not heard. Whisper (forced): sibilants at one foot, aspirates at four inches. *Left Ear:* Drum retracted and dull. Light-reflex contracted. Process of malleus prominent. Weber increased, Rinne negative, Swabach lengthened. Tone-limits, 2048-128. Watch not heard. Whisper (forced): sibilants at eighteen inches, aspirates at one foot. Tube admits very little air on inflation.

A medium-sized gold electro-bougie (Duel-Meyrowitz) was, therefore, passed into the left tube under the usual precautions, and 1 milliampère of current admitted from a thirty-cell dry battery. The bougie advanced readily through the membranous portion, but met with some resistance in the bony canal. The latter resistance was fairly uniform, yielding gradually, until the bougie had reached a point one and one-half inches from the pharyngeal opening. It then impinged against what felt like a firm, fibrous constriction. Steady but gentle pressure with 1.5 milliampères of current failed to overcome the obstruction at the end of five minutes, so the attempt was discontinued and the bougie slowly withdrawn. The discomfort of the operation and the crackling sounds experienced in the bony canal were slight. The hyperemic reaction of the drum was not unusual. The hearing remained unchanged. The patient was advised in regard to nasal spray, hygiene of the nose, throat, and teeth, hemic tonic, and general hygiene, and recommended to return on the third day for inflation. He was unable, however, to do so until one week later.

On February 25, the smallest bougie was passed easily, with

1 milliampère of current, to the constriction, one and one-half inches from the mouth of the tube. As the stricture did not differ essentially in situation and feel from many others met with, and furthermore corresponded with the conclusions reached by Bryant⁵ in regard to fibrous constrictions, no unusual apprehension was felt in attempting to overcome it under the rigid precautions necessary in view of the proximity of the chorda tympani, the tympanic membrane, and the facial nerve. Firm, gentle pressure was maintained and at the end of a minute the current was increased to 1.5 milliampères. The crackling and the discomfort from the pressure were slight. In about another minute the bougie suddenly advanced about an eighth of an inch and met a firmer resistance, accompanied by sharp pain. The bougie was at once withdrawn one quarter of an inch, when on looking at the patient's face the entire left side was seen to be relaxed. Treatment was immediately discontinued. The left eye could be opened slightly; control of the other muscles on that side of the face was lost. Pain subsequent to the accident was slight and of short duration. The usual amount of hyperemia of the drum was present. On testing the hearing: sibilants were audible at three feet, aspirates at two feet, a gain of eighteen and twelve inches respectively. In about fifteen minutes the left eye could be opened wider and the eyebrow raised slightly. As the prognosis for the paralysis and the hearing was favorable the patient was reassured, especially as he was aware of an immediate diminution in the feeling of stuffiness in the ear and of an increase in the hearing.

February 27th. Paralysis still marked. Hearing unchanged. Tubes were inflated, and, as on all previous and subsequent visits, the mouths of the tubes were swabbed with adrenalin before, and with silver nitrate after the inflation.

March 4th. Paralysis less marked. Tube more open. Hears watch for the first time at one-half inch; sibilants at three and one-half feet, aspirates at two feet.

18th. Marked increase in the tone of all the left facial muscles, except the levator palpebrae superioris. Galvanic current applied over left side of face and forehead. Tubes inflated.

25th. Slight droop of the upper eyelid and of the left corner of the mouth, otherwise the flattening of the face has disappeared. Galvanism to face. Tubes inflated.

April 1st. Ptosis very slight. Tube is open. Hears sibilants at six feet, aspirates at two feet. Galvanism to face.

8th. No evidence of paralysis except sluggish contraction of levator palpebrae superioris in looking up. Tube inflated. Galvanism to face.

15th. Before inflation hears sibilants at six feet, aspirates at two feet; after inflation, sibilants at twelve feet, aspirates at four feet. Galvanism to face.

22d. Has had sore throat for several days. Mucus in left tube on inflation. Hears: before inflation, sibilants at eight feet, aspirates at three feet; after inflation, sibilants at twenty-five feet, aspirates at ten feet. Galvanism to face (last treatment).

From April 25 to July 28 the patient was obliged to be away on business and was seen only three times. During this interval he had several slight colds, the ear had felt stuffy, and the hearing had diminished. On the three occasions when seen inflation was not free, but as the case could not be followed closely bougieing was contraindicated.

On July 28 sibilants were heard at six feet, aspirates at three feet. Inflation was not free. A medium-sized bougie was accordingly passed with 1 milliampère of current, and advanced one and three-eighths inches from the mouth of the tube. The membranous portion was felt to be congested, but yielded gradually to slow and gentle ironing. The bony canal presented markedly less resistance than when first bougieed on February 17. There was but little discomfort, although the patient became very apprehensive as the bougie entered the bony canal and the crackling began. The reaction was slight. The sense of fullness in the ear was at once relieved, but the hearing remained unchanged. In the following months the patient was again called away and was not seen until October 16, when the tube was found to be more open. Sibilants were heard at ten feet, aspirates at four feet. Another interval occurred on November 3, when the left drum was found to be reddened along the long process of the malleus and Schrapnell's membrane. When seen again on December 23, the redness had disappeared, but the tube was closed.

December 27th. Hearing before inflation: sibilants at eighteen feet, aspirates at four feet. After applying adrenalin to the mouth of the tube inflation was free. Sibilants were then audible at twenty-five feet, aspirates at eight feet.

30th. Before inflation hears sibilants at twenty-five feet, aspirates at ten feet; after inflation, sibilants at thirty feet, aspirates at twenty-three feet. The watch is audible at one inch. Tone-limits, 2048-26.

From December 30 to January 19, the date of last visit, the patient has been seen at regular intervals. Aspirates were heard at twenty-five feet, and the tube has remained open.

During the eleven months which have elapsed since the injury, the hearing has, therefore, increased for the whispered voice (not forced) from less than one foot to over twenty-five feet. The only evidence of the paralysis remaining is purely subjective, the patient stating that the left eye "waters" more easily than the right. In this period the patient has been seen and treated twenty-five times and the tube bougieed three times.

It is beyond the scope of this paper to enter into a purely theoretical discussion of the possibilities which might be brought

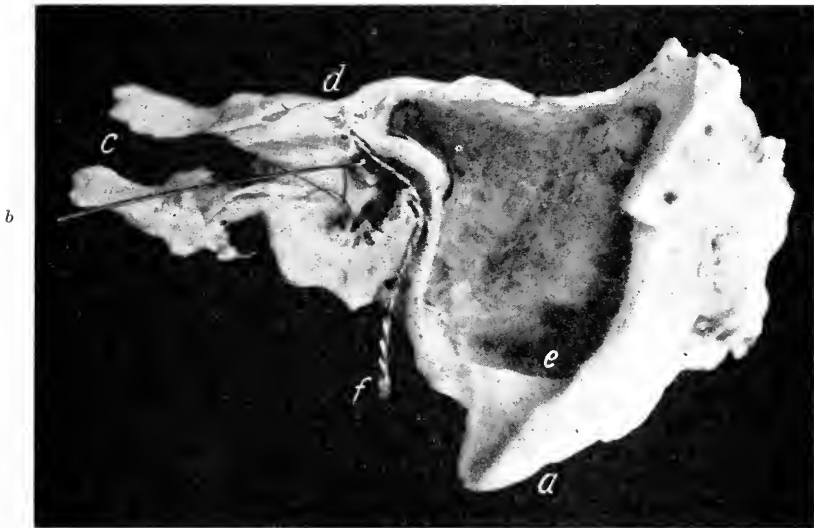
forward to explain this rare accident. The part played by individual predisposition and by the electricity in the production of the paralysis are questions too subtle for accurate determination. Such factors are, moreover, regarded as of little moment, even as contributing causes, in comparison with the mechanical forces, and the anatomical relations of the parts. A study of the gross anatomy of the Eustachian tube and the middle ear in fresh specimens and the skeletal preparations in the laboratory of the New York Eye and Ear Infirmary discloses anomalous conditions in a percentage of cases that can readily be made to explain this lesion.

In many fresh specimens the thin, curved lamina of bone forming the outer wall of the aqueductus Fallopii, situated above the fenestra ovalis and between it and the tegmen tympani on the inner wall of the tympanic cavity, is partially or entirely defective. This thin plate of bone is the only covering of the facial nerve as it passes through the inner wall of the tympanic cavity (second part of the nerve beyond the genu externum), except for the lining membrane of the tympanum and the nerve sheath. In quite a few of the specimens the ostium tympanicum was also found at an abnormally high level on the anterior wall of the tympanum (5 to 7 mm. instead of the normal 4 mm. above the lowest point on the floor). Thickening and unusual prominence of the upper part of the ostium (processus cochleariformis) was noted, which would obstruct the passage of the bougie into the tympanic cavity. The latter observation is of especial interest in connection with the studies of Bryant,¹ whereby it was demonstrated that strictures of the tube, when present, are more frequently met with at the openings of the tube than elsewhere. Such an obstruction yielding suddenly to pressure would allow the bougie to be advanced sharply and forcibly against the ridge of the aqueduct of Fallopius on the inner wall of the tympanum, provided that the ostium were abnormally high or that the aqueduct were unusually prominent in the second part of its course. Under normal conditions—as it can be demonstrated on anatomical specimens—the bougie on entering the tympanic cavity passes upward, outward, and backward at a very acute angle, or even parallel, to the ridge of the aqueductus Fallopii. Even when it impinges against the latter it is in the nature of a glancing blow. Given, however, a Eustachian tube actually shorter than the average (less than one and one-half inches), or admitting the tip of the silver catheter an eighth of an inch or more farther than usual, in connection with a fibrous or bony obstruction at the ostium tympanicum; or presupposing the latter opening to be at an abnormally high level; if the facial nerve is exposed by defective bony covering, with or without the dangerous proximity to

¹ Stricture of the Eustachian Tube in Aural Diseases and its Treatment, *Annals of Otol., Rhin., and Laryng.*, June, 1905

the ostium produced by unusual prominence of the aqueductus Fallopii, the electro-bougie, on suddenly overcoming the obstruction at the ostium, may be driven against the facial nerve and bruise or crush it against the inner wall of the aqueduct, at a distance of one and one-half inches or more from the pharyngeal opening of the tube. In the accompanying illustration the bougie lies in the bony canal and strikes the facial (silk thread) at nearly a right angle.

The practical lesson of the case is obvious, even though the anatomical peculiarities cited are less frequent than would appear from the specimens studied. It is of great importance for the



a. Mastoid process. *b.* Bougie in the bony portion of Eustachian tube (part of wall removed by section). *c.* Carotid canal. *d.* Tegmen tympani. *e.* Mastoid cavity (cells removed). *f.* Silk thread representing the course of the facial nerve through the aqueductus Fallopii.

physician and patient to be prepared for such a contingency, the bearing of which is immediate with reference to proper warning to the patient and careful technique, and remote in regard to serious permanent damage and ensuing medico-legal complications. In view, however, of the favorable prognosis and rarity of the lesion, and the great benefit to be derived and confidently expected, in the majority of such cases of impaired hearing, from the proper use of the electro-bougie, the possibility of such an accident does not form a serious objection, in my opinion, to this method of Eustachian dilatation.

CLINICAL AND EXPERIMENTAL EXPERIENCE WITH COLLOIDAL SILVER AND A VIRULENT STREPTOCOCCUS.¹

BY FRANK P. VALE, M.D.,

OF WASHINGTON, D. C.

ANY means by which one can cope successfully with a severe streptococcic infection, or prevent it, is of interest alike to the internist, surgeon, and obstetrician, because of the ubiquity of this organism, its protean manifestations, and its death-dealing properties. The internist now knows it is responsible for many cases of pleurisy, meningitis, acute articular rheumatism, suppurative arthritis, double parotiditis, hematuria, bronchopneumonia, enterocolitis, etc., though not always able to distinguish clinically those instances in which it is the etiological factor. To the surgeon and obstetrician it is only too well known as playing a large part in all wound complications, but fortunately their aseptic methods have curtailed its ravages. Colloidal silver is a remedy which has received much attention during the past three or four years. An impartial perusal of its literature cannot fail to impress one with its value in various infections, not only those due to the streptococcus, but to the staphylococcus, pneumococcus, anthrax bacillus, etc.

An allotropic form of silver was first described by Carey Lea in 1880,² but remained simply a laboratory curiosity until 1897, when introduced into surgical practice by Credé, of Dresden, in a paper read before the Twelfth International Medical Congress at Moscow. Credé had been led to an inquiry into the therapeutic value of silver and its salts through observation of his father's well-known predilection for nitrate of silver in the treatment of ophthalmia, and also by his early recognition of the shortcomings of iodoform and mercurial preparations in wound treatment.

Nitrate of silver proved entirely unsatisfactory in the treatment of wounds, because of its ready decomposition and caustic action. Various albuminates were then tried, but his investigations were without result until Halsted's method of dressing wounds with silver-foil was witnessed. Following up this cue he found that metallic silver placed in aseptic wounds remained unchanged and was non-irritating, but when covering septic wounds, or a culture of one of the pyogenic cocci, the silver-foil disappeared, was dissolved—and in the Petri dish the silver was surrounded by a sterile zone. The only explanation was that the products of bacterial growth built up soluble antiseptic combinations with the silver. Chemical examination of the sterile zone surrounding the silver-foil in the culture

¹ Read at a meeting of the Medical Society of the District of Columbia, Washington, April 11, 1906.

² Silliman's *Journal of Science*, third series, vol. xxxvi, p. 477.

medium corroborated this hypothesis and demonstrated the lactate to be the principal compound thus formed. Experiments with the lactate and about twenty other organic salts of silver finally proved the citrate the most suitable for surgical purposes, and since then Credé has employed the citrate of silver with extreme satisfaction in the treatment of all wounds—for irrigation, impregnation of dressings, and for the sterilization of catgut.

As the result of this success the idea suggested itself that, as under the influence of pyogenic cocci antiseptic salts were formed from silver, perhaps it would be possible to bring about a disinfection, so to speak, of the entire body, if silver could be brought directly into the blood and body fluids, which would, of course, necessitate a form of metallic silver soluble therein. After consultation with many competent chemists, von Heyden produced a colloidal silver which, though not perfectly soluble, was applicable in following up this idea.

This preparation consists of small black particles of metallic luster, easily crushed, and containing 92 to 98 per cent. of silver; it is inodorous and almost tasteless. It is soluble in one to twenty parts of water; strictly speaking, however, it is not a solution, for the silver is merely in suspension, in particles so fine as hardly to be seen with the microscope; it filters through paper, but not through animal membranes.

At first it was employed chiefly in the form of a 15 per cent. ointment by inunction. It was rather irritating for hypodermic use. In the presence of a 1 per cent. egg albumen the silver is not precipitated by salts and acids, and in this combination has been administered by the mouth. In exceptionally severe cases Credé thought it might be given intravenously as bichloride of mercury was then being used by Bacelli, though at that time he had not thus employed it. Its intravenous use was taken up first at the Veterinary High School, Berlin, by Prof. Dieckerhof, and later by other veterinarians, and thus was successfully employed in the treatment of sepsis and various infectious diseases of cattle. Feeling thus relieved of the necessity of animal experimentation by its success in veterinary practice, Credé has employed colloidal silver by intravenous injection, since 1898, in the treatment of sepsis, pyemia, acute articular rheumatism, advanced pulmonary tuberculosis, and many other conditions, in doses of 5 to 20 c.c. of a 0.5 to 1 per cent. solution.¹

My interest in colloidal silver, its value and limitations, especially when given intravenously, was aroused by the results noted in a most serious streptococcic infection seen in 1905. I had used it by inunction in the previous several years in a variety of affections, among them instances of streptococcic infection, and uniformly

¹ Berl. klin. Woch., September 16, 1901, p. 941.

with gratifying success, so I that was unprepared for the temporary failure which attended my efforts in this case.

On July 5, I was called to see a young man, aged nineteen years. For two days he had been feeling a little below par. His nose was slightly swollen, but that fact was not complained of, nor had it been scarcely noticed; his temperature was 102° . The condition was readily recognized as a facial erysipelas. I ordered the liberal application of Credé ointment to the nose and face, fully expecting, and in fact confidently predicting, a prompt cure. Perhaps this might have been the result had it not been for his indiscretion in getting out of bed the next morning, as he felt perfectly well. About three hours later I was hurriedly sent for, and found him suffering with a violent epigastric pain. The abdomen was quite soft, and my attention was immediately directed to the chest by his sighing respirations and tumultuous heart action. The lungs were normally resonant, but there was a pleuritic friction rub below the right nipple, and a blowing murmur at the apex of the heart; temperature, 104° . The streptococcus was evidently exercising its predilection for serous surfaces, as shown by the beginning pleurisy and endocarditis. An ice-bag was placed on the precordium, and during the next forty-eight hours Credé ointment was applied freely by inunction over the entire chest and abdomen.

On the evening of the third day it was apparent the infection was gaining the upper hand: an effusion had developed in the right pleural cavity; the heart action was more tumultuous, the blowing murmur at the apex louder; temperature, 104.6° . During the next twenty-four hours he was given five intravenous injections of 5 c.c. each of a 1 per cent. solution of colloidal silver, and one tub bath, at 80° F., of twelve minutes' duration: with the result that the apical murmur disappeared entirely, the heart action greatly improved, and the pleuritic exudation diminished considerably.

But at 10 P.M. on the fourth day, in spite of one-fourth gram of colloidal silver thus administered intravenously, his temperature was 105° ; pulse, 100; respirations, 34; over the entire posterior aspect of both lungs were crepitant rales, impaired resonance, and increased vocal fremitus. Still more disheartening, not only had the swelling of the nose extended to the cheeks and scalp, but an entirely new focus of erysipelas, an area the size of the palm of the hand, had appeared on the calf of the left leg, at the site of an insect bite received in the woods a few days before the beginning of his illness. Extending from this new area up the leg to the knee were three parallel red streaks, looking like scratch marks, and indicating the course of inflamed lymphatic channels. A second bath of the same duration and temperature was given and a sixth intravenous injection, this time 10 c.c. of a 1 per cent. solution.

The morning of the fifth day the temperature dropped to 103.2° , respirations to 25, pulse to 80; the lungs were normally resonant

posteriorly where there had been beginning consolidation the night before. But at 4 P.M. the temperature was 105° in spite of the subsidence of the alarming chest symptoms; the new erysipelatous area on the leg had greatly increased in size, the entire leg was swollen, and the lymphangitis had extended to the groin; the urine was loaded with albumin and contained a few granular casts. The intravenous injection of colloidal silver was increased to 5 c.c. of a 5 per cent. solution, this amount being repeated at midnight and twice the next day. That ended the intravenous injections, for every available vein had been used until none could be entered again with the needle, by reason of considerable swelling of the arms in consequence of the escape into the tissues of some of the solution during attempts at injection into the smaller veins.

During ninety-six hours the patient received 1.5 grams of colloidal silver intravenously, 1 gram being injected during the last twenty-four hours of that period. The backbone of the attack was broken by this large dose of 1 gram intravenously inside of twenty-four hours, for on the evening of the sixth day, at the time of the last intravenous injection, the temperature had dropped to 102.2° , and the condition of the leg was rapidly improving. Had this large dose been employed from the start, or had I been able to continue it a short time longer, I believe this would have been the end of the attack.

The inunctions were continued, the face, entire front of the chest and abdomen, and the entire left leg being continually covered with the ointment and enveloped with oiled silk, as much as thirty grams a day being thus applied; this I supposed, of course, would be sufficient to maintain the good effects obtained by the intravenous injections. But in this I was to be disappointed, for on the evening of the eighth day, forty-eight hours after the last intravenous injection, the temperature again showed a tendency to rise, and the erysipelatous areas again began to extend.

Rectal injections of colloidal silver were resorted to, but did not control the smouldering embers of the infection until the dose was increased from 0.5 gram to 2 grams three times a day. For the next ten days, that is from the eighth to the eighteenth day of the disease, the temperature continued between 102° and 103° ; but the morning of the eighteenth day it was so near normal that the rectal injection was reduced to 1 gram, and so continued until the twenty-first day, when symptoms appeared which indicated the limit had been reached in the administration of colloidal silver. Fortunately, it was no longer needed, for on the evening of the twentieth day the temperature was for the first time normal. By the rectum the patient had received 50 grams of colloidal silver; by the skin it is impossible to say how much was absorbed, but about 500 grams of a 15 per cent. ointment was used.

During the thirteen days of rectal injections the erysipelas cleared

on the face, after extending to the ears and well into the scalp. When the face had appeared quite normal for several days, the application of the ointment to the face was discontinued. Within forty-eight hours the lips and nose again began to swell, and though the inflammatory process was much less marked than in the primary attack, a dusky redness spread not only over the entire scalp, but this time down the neck, over the entire back and left arm, over the right shoulder and entire front of the chest, with here and there an angry patch the size of the palm of the hand. During this same period of rectal injections the focus on the leg extended below to the dorsum of the foot, where the swelling and inflammation were particularly severe, and above to the middle of the thigh, so that the only part of the entire cutaneous surface not involved at one time or another was the right arm and leg, the upper part of the left thigh, the buttocks, and in front the abdomen. It was found that after the migrating inflammation had passed a given point, and though for several days the skin had appeared normal, the inflammatory process would again flare up if the local silver application was discontinued, so that at one time about two-thirds of the body was covered with the ointment. In fact, after the temperature had been normal for a week, that is nearly a month from the beginning of the disease, the ointment was again left off the face, and again for the third time the lips and chin began to swell, and coincidentally a new area of erysipelas appeared over the right trochanter; but both areas quickly subsided on the application of the ointment, and the temperature did not rise.

I was constantly on the lookout for some symptom indicating the limit had been reached in the administration of these large amounts of silver. The sclerotics had a peculiar blue tint suggesting the presence of a silver deposit in all the tissues. On the nineteenth day of the disease some pain in the stomach was complained of; and on the twentieth there was considerable vomiting of a watery fluid of such a gray tint as to suggest the presence of metallic silver, though none had been taken by the mouth. A specimen of the vomitus was examined by Dr. E. R. Hodge and found to contain silver. The gastric pain and vomiting soon disappeared on stopping the rectal injections.

The boy's troubles were not all over with the disappearance of the fever. During the next three weeks, that is from the twenty-first to the fortieth day, thirteen large abscesses formed in the left leg and arm, from which about two liters of pus was evacuated, containing as it was ascertained, the streptococcus in pure culture. In the left foot the inflammatory process reached almost the stage of gangrene; a four-inch incision on the dorsum disclosed a subcutaneous slough the size of the hand, and a second incision of two inches along the tendo Achillis showed a black necrotic area the size of a silver dollar. Most of the abscesses formed very rapidly,

practically with no local reaction; one or two hundred cubic centimeters of pus would be evacuated and the abscess cavity would close up in a most remarkable manner in three or four dressings. Two months after the subsidence of the fever, and when convalescence was nearly complete, the virulent streptococcus gave him a parting stab in the form of a small axillary abscess. It is needless to say his convalescence was very tedious; he was far more emaciated than any typhoid patient I have ever seen.

On the twenty-second day of the disease I was called about three o'clock in the morning, and found the patient in a state of collapse which nearly proved fatal; temperature 95° per rectum, breath and extremities cold, no pulse, and heart action barely audible. Hot salt solution per rectum with adrenalin brought a prompt response, though it had to be repeated several times to meet a recurrence of these symptoms. This collapse was evidently precipitated by the loss of fluids to the tissues incident to the copious vomiting of the previous twenty-four hours; and for a week fluids had to be administered freely to prevent a threatened recurrence.

The left arm could not be used for weeks. At one time it was so thin, the skin so tightly drawn over it, the biceps muscle so indurated, as to remind one of a well-dried part in the dissecting-room.

That the colloidal silver was to be credited with the cure of this patient was the unavoidable impression made upon me in watching it. Locally applied the silver exerted a most important local influence, for repeatedly when its local use was discontinued the inflammatory process in the skin flared up in areas which had apparently recovered completely some time before. The rectal injection, increased to 9 grams a day, finally overcame the remnants of the infection, but only after the backbone of the disease had been broken by the intravenous injection of 1 gram within a space of twenty-four hours—0.5 gram intravenously, extended over a period of seventy-two hours, having proved ineffectual.

Accumulated experience has proved conclusively the value of colloidal silver in combating various infections, both in the lower animals and in human practice, but it would extend this paper far beyond reasonable limits to attempt to review it. I now desire to turn to another phase of the application of colloidal silver, that is the question of its prophylactic value, concerning which there is but meager clinical and experimental data. Having in my possession, from this case, a virulent streptococcus which had been successfully combated, as just related, I undertook a few experiments on rabbits, with a view to obtaining further impressions as to its value and limitations in preventing infection by this same organism.

It was most natural for Credé to endeavor to extend the application of colloidal silver to the prevention of infection.¹ In recom-

¹ Monatsschr. f. Geburtshülfe und Gynäkologie, December, 1898, p. 583.

mending the insertion of suitable suppositories in the uterus and vagina after childbirth, he was simply making use of its local bactericidal effect. That was undoubtedly also his idea in leaving two or four tablets in the abdominal cavity after intestinal resection and similar operations especially likely to be followed by infection; the tablets were composed of 0.05 gram of colloidal silver rubbed up with a like amount of sugar of milk, so as to be readily soluble, and as many as ten tablets, he thought, might thus be allowed to remain in the peritoneal cavity. In fact, however, in addition to the bactericidal effect of the silver, he was unwittingly taking advantage of a property of the peritoneum which has only recently been the subject of laboratory inquiry, and hardly yet applied clinically: I refer to the local immunity acquired by the peritoneum against infection as the result of a passing irritation, it having been found that intraperitoneal injections of salt solution, urine, (2 per cent.), nucleic acid, bouillon, blood serum, etc., so increases the resisting powers of the peritoneum that many times a lethal dose of various micro-organisms can be injected into its cavity, twenty-four hours later, without any effect.¹

A further natural extension of these efforts at prophylaxis, and the outcome of his success in treating various infections, once established, was Credé's advice to give colloidal silver intravenously, during or following all septic operations, just as many surgeons give a saline transfusion.² In support of this departure he might have invoked the experience of Ewers in veterinary practice, though unique, I believe, in preventing by intravenous injection of colloidal silver a fatal dysentery which is endemic on some farms and attacks calves in the first days of life. The only experimental evidence I have been able to find favorable to colloidal silver is that of Beyer,³ an assistant of Credé, which, however, is along the line of clinical and veterinary experience as to its value in combatting various infections once established, though in itself not conclusive, as but two dogs were used, and no control.⁴ The only other experiments bearing in any way on the value of colloidal silver, either in combating or preventing infection, in which the small laboratory animals were employed, are those of Brünner, Trommsdorf and Cohn—all equally unsuccessful in demonstrating any virtue in prophylactic

¹ Lissacoff, *Zeit. f. Hygiene*, 1894, p. 287; Borchard, *Deut. med. Woch.*, 1904, No. 49; Miyake, *Mitteilungen aus den Grenzgebieten der Med. u. Chir.*, 1904, xiii, p. 179; Petit, *Ann. de l'Inst. Pasteur*, 1904, xviii, 407; Durham, *Medico-Chir. Trans.*, London, 1897, lxxx, 191; Mikuliez, *Lancet*, July 2, 1904, p. 1.

² *Archiv. f. klin. Chir.*, 1903, xlix, 225.

³ *Munch. med. Woch.*, 1902, No. 8, p. 331.

⁴ One dog was given intravenously 10 c.c. of a virulent staphylococcus culture. Twenty-eight hours later the animal was getting progressively worse; it then received 0.4 gram of colloidal silver, with prompt recovery, the temperature reaching normal on the fifth day. In a second dog he obtained the same favorable result from a similar dose subcutaneously, but the fever lasted ten days and the effect of the treatment was not so striking.

injections of colloidal silver against inoculation with various micro-organisms.

The article of Brünner¹ is much quoted, but only four of his experiments concern this aspect of the subject. In only one of them was the result favorable to colloidal silver: 1.50 of a staphylococcus culture was given a small dog intravenously, and a half hour later 0.1 gram of colloidal silver—the animal living seven and one-half days, while the control lived but eighteen hours. But in a second experiment a larger amount of the staphylococcus culture was injected and the animal died in seven and one-half hours, while the control lived. In the two remaining experiments the animals receiving the colloidal silver died as soon as the controls.

In the experiments of Trommsdorf² twelve dogs were given intravenous injections of colloidal silver varying from 0.02 to 0.03 gram, which in proportion to weight is about ten times the amount recommended by Credé as a prophylactic in human practice. Six, twelve, twenty-four, and thirty-six hours later a culture of the organism of swine erysipelas was injected intravenously—all the animals dying as soon as the controls.

The experiments of Cohn³ are the most exhaustive. In two of them the cholera spirillum was the infecting organism: a guinea-pig receiving an intraperitoneal injection of a bouillon culture, followed by 0.05 gram of colloidal silver, lived four hours longer than the control; but a second guinea-pig died in twenty-four hours and the control lived. In four experiments with anthrax injected intravenously, followed by colloidal silver in dose of about 0.1 gram per kilo of animal weight, all the controls lived the longer. In two of four experiments with the staphylococcus injected intravenously the results were slightly in favor of the animals receiving the colloidal silver.

It will be observed that in these experiments, with the exception of two intraperitoneal inoculations, the infecting organism was thrown directly into the circulation, in relatively overwhelming numbers. This method of inoculation in no way simulates the manner of acquiring disease through the ordinary channels of infection, when the invading organism gains access to the circulation late in the course of the disease, or frequently not at all. In experiments with the streptococcus, however, three in number, Cohn inoculated the scarified ear of a dog with a loopful of the culture, followed by an intravenous injection of colloidal silver, about 0.1 gram per kilo of animal weight, and in each instance the control lived the longer.

But in these last mentioned experiments of Cohn the colloidal silver was injected at the time of the inoculation with the strepto-

¹ Fortschr. d. Medizin, May 16, 1900, p. 381.

² Münch. med. Woch., August 5, 1902, p. 1300.

³ Centralb. f. Bacteriologie, 1902, vol. xxxii, p. 732.

coccus. Now the leukocytosis following the administration of colloidal silver, which is at its height at the end of twenty-four hours, plays an important, but as yet imperfectly understood, part in its action. It has been shown¹ in efforts at the prevention of infection through a hyperleukocytosis induced by the injection of nuclein, peptones, albumoses, and other substances, that to obtain favorable results it is necessary that the inoculation be made at the height of the induced leukocytosis. It was with the idea of filling up this small lacuna that I undertook the experiments mentioned, inoculating twenty rabbits subcutaneously twenty-four hours after the injection of colloidal silver, when the leukocytosis was at its height.

Twenty-four hours after an intravenous injection of colloidal silver the average leukocytosis was 12,000, due chiefly to an increase in the polynuclear cells; after intraperitoneal injections the leukocytosis was of about the same intensity, but due chiefly to an increase in the lymphocytes, as if the entire army of polynuclear phagocytes had responded to the local call in the peritoneal cavity. The degree of leukocytosis bore no relation to the amount of colloidal silver injected.

The streptococcus had been kept for a month without transplantation, yet it was found that 5 c.c. of a twenty-four-hour culture killed two-months'-old rabbits in about eighteen hours, when the inoculation was intravenous. The organism was peculiarly capable of surviving unfavorable conditions for growth, as it was successfully transplanted from an almost dry agar tube at the end of three months.

The colloidal silver was administered in some instances subcutaneously, and in others into the peritoneal cavity or intravenously, the dose varying from 0.003 to 0.500 gram per kilo of animal weight, in 0.5 to 5 per cent. solution.² The result of these prophylactic injections can be told in a few words. In no instance was a local reaction from the subcutaneous inoculation with the streptococcus entirely prevented, but with the largest dose of 0.5 gram per kilo of animal weight the inflammatory process was transitory and in marked contrast to that excited in the control. As the result of a particularly severe local reaction in a rabbit receiving intravenously 0.003 gram per kilo, I had my attention directed to the possibility of these smaller doses lessening the animal's resisting powers. In support of this idea it was repeatedly noted that the inflammatory reaction was much greater in animals given a previous small intra-

¹ Labbé, *La Presse medicale*, July 18, 1903, p. 519.

² In one rabbit the largest dose of 7 c.c. of a 5 per cent. solution was fatal when injected into a vein as rapidly as the syringe could be emptied. There were two or three convulsive movements, respirations ceased, the heart action continuing about three minutes. Postmortem: the left ventricle was found empty, while the right side of the heart and all the large veins were distended with a continuous blood-clot; the lungs were compressed against the back of the thorax, dark in color, and perfectly dry on section. The rapidity of the injection was a factor in producing this death, for a similar injection in another rabbit, given very slowly, was apparently without ill effect.

peritoneal injection of colloidal silver. Moreover, one rabbit was so far immunized by repeated small doses of the streptococcus as twice to have no local reaction, but when again inoculated twenty-four hours after a subcutaneous injection of colloidal silver, 0.004 gram per kilo, the usual erysipelatos inflammation appeared. All the controls lived, while two of the animals receiving small doses of colloidal silver and inoculated as related, twenty-four hours later with the streptococcus, died: in one, the dose was 0.070 gram per kilo subcutaneously, and in the other, 0.030 gram per kilo intravenously.

Of course, these experiments do not permit of any broad generalizations, but taken in connection with those of Brümmer, Trommsdorf, and Cohn, they at least suggest—in spite of the well-demonstrated value of colloidal silver against infection once established—that in doses heretofore advocated, no confidence can be placed in its ability to prevent infection; and they further suggest these small doses may even lessen the patient's resisting powers, whether used intravenously, in the peritoneal cavity, or subcutaneously, and actually be an added source of danger.

A NOTE ON THE PRODUCTION OF VASCULAR LESIONS IN THE RABBIT BY SINGLE INJECTIONS OF ADRENALIN.¹

BY RICHARD M. PEARCE, M.D.,

PROFESSOR OF PATHOLOGY AND BACTERIOLOGY, ALBANY MEDICAL COLLEGE; DIRECTOR OF THE
BENDER HYGIENIC LABORATORY, ALBANY, NEW YORK,

AND

LEON K. BALDAUF, M.D.,

INSTRUCTOR IN PATHOLOGY AND BACTERIOLOGY, ALBANY MEDICAL COLLEGE.

(From the Bender Hygienic Laboratory, Albany, New York.)

THE many publications which have followed Josué's demonstration of the power of adrenalin to produce degenerative changes in the rabbit's aorta have added much to our knowledge of the degenerative, infiltrative, and reparative processes which may occur in bloodvessels; but, unfortunately, from the point of view of comparative pathology, the value of this method of experimentation has been lessened by the failure to produce lesions entirely analogous to those of arteriosclerosis in man—the condition which it most closely resembles, and further, by the absence of an adequate explanation of the manner in which adrenalin acts to produce such lesions.

¹ Read at the meeting of the Association of American Physicians, Washington, D. C., May 15 and 16, 1906. This work was conducted under a grant from the Rockefeller Institute for Medical Research.

This method, however, is so full of promise that it seemed advisable to continue the investigations¹ carried on in this laboratory during the past two years, in the hope of producing, by varying the conditions of the experiment, lesions more closely resembling those of arteriosclerosis in man, and at the same time to study by exact physiological methods the action of adrenalin. These studies are as yet incomplete, and it is our intention in this communication to refer only to the lesions caused by single injections of adrenalin.

That repeated frequent injections of adrenalin are necessary to the production of experimental vascular lesions appears to be the opinion of all who have used it. Loeb and Githens² have stated that lapse of time is of more importance than frequency of injections or size of dose, and although they alone appear to have noted this fact they did not materially limit the number of injections in their experiments.

Our attempt to produce lesions by single injections was mainly for the purpose of testing the theory offered by Pearce and Stanton, and later supported by the former in his study of experimental myocarditis due to adrenalin. This was, briefly, that in the aorta and the myocardium the primary condition is a localized anemia due to the direct action of adrenalin on the arterioles of areas not readily supplied by collateral circulation. To this factor is added the influence of the strain thrown upon these poorly nourished parts during the height of the increase in blood pressure, an influence sufficient presumably to cause permanent injury. If lesions could be produced by single injections of adrenalin this theory would be strengthened and that of direct toxic action weakened.

As it had been previously shown that necrotic foci were present in the aortas of animals that had received four and five injections, three groups of animals were given respectively one, two, and three intravenous injections of one-half to one and a half minims of a 1 to 1000 solution of adrenalin (Parke, Davis & Co.). Although lesions were produced in animals that had received two and three injections, they became of little importance, in view of the very positive results following single injections. Of ten animals in the latter series, four died within a few minutes after injection; of the remaining six, one of which died at the end of seven days, and five of which were killed after sixty-five to seventy days, all showed very definite vascular lesions. The protocols of these experiments may be briefly summarized as follows:

Experiment 13. A full-grown rabbit received in the ear vein on December 9, one-half minim of a 1 to 1000 solution of adrenalin.

R. M. Pearce, and E. McD. Stanton, *Experimental Arteriosclerosis*, Jour. Exper. Med., 1906, viii, 74; R. M. Pearce, *Experimental Myocarditis: A Study of the Histological Changes following the Intravenous Injection of Adrenalin*, *ibid.*, 1906, viii, 400.

The Effect of Experimental Conditions in the Vascular Lesions Produced by Adrenalin, *AMER. JOUR. MED. SCI.*, 1905, cxxx, 658.

No ill-effect was noticed after recovery from the initial disturbance. On December 16 the animal was found dead. Postmortem examination revealed œdema of the subcutaneous tissues, minute hemorrhages in the intestinal serosa, and about 20 c.c. of slightly blood-tinged fluid in the peritoneal cavity, but no increase of fluid in the pericardial or pleural cavities. The heart was somewhat dilated and its muscle pale. Beneath the epicardium were numerous punctate hemorrhages. The aorta throughout the thoracic and abdominal portions presented a peculiar wrinkled appearance without well-defined thickening or change in color. The other organs were not noteworthy.

Histological examination of the aorta at different levels revealed an extensive and diffuse degeneration of the media with more or less complete necrosis of the muscle cells, and a straightening and fusion of the elastic fibers with a few angular bends. About two-thirds of the circumference of the vessel were involved and transversely the middle third of the media. In the heart muscle were focal areas of degeneration, with slight increase of connective tissue and accumulation of lymphoid cells.

Experiment 17. A rabbit weighing 1100 grams was injected on January 4 with one-half minim of adrenalin. It was chloroformed on March 14; weight 1710 grams. Upon postmortem examination 75 c.c. of clear watery fluid was found in the peritoneal cavity. The aorta from its origin to the cœliac axis presented numerous irregular calcified plaques varying in size from 0.2 to 1.5 cm. in diameter. The other organs showed no changes. Upon histological examination the aortic lesions were those of degeneration and calcification.

Experiment 20. A rabbit weighing 1920 grams was injected on January 9 with one minim of adrenalin. Killed March 14; weight, 2120. Postmortem examination revealed no lesions except in the aorta, which from the origin to the bifurcation was dotted with oval and linear elevated areas of thickening and calcification. The areas were larger and more abundant in the ascending portion. Well-marked thickening was present about the orifices of the coronary arteries. Histological examination showed the usual picture of necrosis and calcification.

Experiment 21. A rabbit weighing 2230 grams received on January 9 one and one-half minims of adrenalin; it was chloroformed on March 15. At autopsy no changes were found except in the aorta, which presented just above the cœliac axis a single irregular area of calcification 0.5 cm. in diameter. Upon histological examination very extensive repair was evident about the calcified area, especially in the subintimal tissues.

Experiment 22. A rabbit weighing 1860 grams was injected on January 9 with one and one-half minims of adrenalin. It was chloroformed on March 15; weight, 1910 grams. In the aorta just above the cœliac axis were two calcified patches, the larger of which

measured 0.5 cm. in diameter. The histological picture was that of calcification, with no repair.

Experiment 23. A rabbit, 1950 grams in weight, was injected on January 9. It was killed March 14; weight, 2700 grams. In the upper portion of the abdominal aorta was one small wrinkled thickening 0.3 mm. in diameter, which presents histologically the picture of calcification.

These results, while they offer no explanation of the mode of action of adrenalin in producing vascular lesions, simplify the mode of investigation, in that the problem is limited to the study of the effect of single injections, and comparisons may be drawn sharply between lesions so produced and similar lesions caused by the prolonged administration of other substances, such as nicotin, digalen, and barium chloride. It is evident, however, that in view of these results the theory of direct toxic action is hardly tenable, while that which recognizes a combination of vasovascular disturbance, local anemia, and vascular strain is greatly strengthened.

BACILLUS PYROGENES (NOV. SPEC.?) ASSOCIATED WITH A FEBRILE DISEASE.

BY LEONARD K. HIRSHBERG, A.B., M.D. (JOHNS HOPKINS),
OF BALTIMORE, MARYLAND.

(From the Pathological Laboratories of the College of Physicians and Surgeons, Baltimore, Md.)

THE following account of an unusual disease with the pigmented bacillus isolated from it, is published on account of its general interest and the impossibility of identifying the organism associated with it. The descriptions of most pigmented bacteria are so meager and faulty, especially the absence of animal experiments, that it is dangerous at this day to announce a new species. I even hesitate to go so far as to conclude from the evidence that the bacillus is the etiological factor and responsible for the disease. Yet it seems from the tissue changes in inoculated animals that this bacillus produces a characteristic, well-definable pathological condition.

A search through the literature has yielded no evidence of an organism described completely enough to compare fully with *Bacillus pyrogenes* (nov. spec.?). This name has been selected at the suggestion of Professor William H. Welch, to whom I am much indebted.

On January 2, 1906, a gentleman thirty-six years of age, who had a slight fever, was sent from Lynchburg, Virginia, to Prof. George J. Preston, of Baltimore. The patient was taken to the Baltimore City Hospital, suffering with a number of nervous symptoms, and

slight fever; his temperature ranged between 99° and 100° and 101°, and reached 102° F. only once. His most striking symptoms were meningeal: photophobia, hyperesthesia, restlessness, tremors, both coarse and fine; Kernig's sign was present, and various joints were swollen and painful at different times.

An examination of the patient's blood for typhoid bacilli was negative. A blood count showed a leukocytosis of about 14,000. The patient had a typhoid appearance, but had no rose spots or enlarged spleen. The most striking feature of his symptoms was the involvement of the joints; as one subsided another flared up. The patient refused permission to take cultures from the joints. Prof. Preston felt convinced, from the start, that the case was not one of infection from typhoid bacilli. On February 20, the patient still had fever, whereupon Prof. Preston kindly asked me to make a blood culture. The patient was finally discharged on March 15, 1906. He has remained perfectly well since.

During the patient's presence in the hospital it was possible to make one only agglutination test with the organism which was isolated from his blood. At the end of two hours no agglutination had taken place.

The three Ehrlenmeyer flasks into which the 10 c.c. of blood had been distributed were incubated at a temperature of 37° C., for seventy-two hours. Colonies grew from only one flask.

The surface colonies after twenty-four hours showed themselves on the average about the size of a pin-head. They were small, round, and lemon-colored, and varied in shape from a perfect circle to that of an oval; colonies were slightly raised, shiny, somewhat translucent, and moist. By an inverted No. 3 eye-piece they were yellow, finely granular, with more or less regular edges. The deeper colonies were more concentrated, smaller, and contained a darker nucleus.

On slant agar the growth remained confined to the line of the needle; the stroke was a very deep lemon-yellow color. It was diffuse, irregularly filiform, moist, slightly raised, and shiny.

After seventy-two hours the growth seemed to have reached its maximum. At this time, compared to a seventy-two-hour-old typhoid culture, it was about twice its thickness and twice its width.

Cover-glass preparations contained a small diplobacillus, with rounded ends and almost as broad as long. It measured from 0.6 to 1.4 μ long by 0.5 to 0.8 μ thick. It was completely discolored by Gram's stain. No spores were found. Capsules were present. It was a flagellated organism of the peritrichal variety.

Bouillon had faint cloudiness. Loops of bouillon in hanging-drop preparations showed very actively motile bacilli in pairs and short chains. The motility was equal to or exceeded that of the typhoid bacillus.

In gelatin the puncture gave a very characteristic growth after

twenty-four hours. On the surface for a few days the growth was no larger than the width of the needle. After the fifth day the surface growth spread to a millimeter in diameter, and took on a deep-yellow color. In the depth of the gelatin, along the stab, the growth spread very slightly, became somewhat granular and filamentous, with a pale-yellow tint. In all of the gelatin stabs a beautiful spiral of discrete granular colonies began to appear at the bottom of the stab about the fourth day. Until the seventh day there was no sign of liquefaction, after which it liquefied rapidly.

The growth on potatoes was thick, opaque, and profuse; dark lemon-yellow in color, raised, with a velvety surface, shiny and dry.

Litmus milk became very slightly acid at the end of twenty-four hours. At the end of two weeks many small particles of coagulated casein were seen floating on the surface of the milk.

On peptone there was a cloudy, yellow growth.

No indol was formed.

Fermentation tubes, which contain lactose bouillon, glucose bouillon, or saccharose bouillon, when inoculated with *Bacillus pyrogenes*, produced no gas.

Litmus agar, lactose litmus agar, and mannite litmus agar were acidulated.

The thermal death-point of *Bacillus pyrogenes*, exposed for ten minutes, is 60°.

There was no odor, pleasant or unpleasant, attached to any of the cultures.

The pathogenic power of *Bacillus pyrogenes* was tested by inoculating four rabbits and two guinea-pigs intravenously, intraperitoneally, and subcutaneously. The two former methods, when employed in these experiments, were very effective in killing the animals. Animals inoculated subcutaneously did not die.

Four cubic centimeters of a twenty-four-hour bouillon culture of *Bacillus pyrogenes* was inoculated into the ear vein of a large gray rabbit at 11 A.M. February 27, 1906. It was alive and feeding, but not very active, at 3.30 P.M. At 4 P.M. it was found dead. The autopsy was performed at 12.30 P.M. February 28.

A second rabbit was inoculated with 4 c.c. of a twenty-four-hour old pure bouillon culture of *Bacillus pyrogenes* on February 27. Inoculation was made into the left hind knee or second joint. On February 28 a small amount of fluid seemed to be present and some capitis was felt; this remained until March 7, when the rabbit was found dead.

A third rabbit (small albino) was inoculated in the ear vein on March 1, at 2 P.M., with 0.5 c.c. of a pure bouillon culture of *Bacillus pyrogenes*. The rabbit was killed on March 4. Pure cultures of the organism originally inoculated were obtained from the blood and all the viscera. A description of this autopsy tallies exactly with autopsy No. 1.

A large male guinea-pig inoculated in the peritoneal cavity with 1 c.c. of a twenty-four-hour bouillon culture of *Bacillus pyrogenes* on April 7, at 1 P.M.; the guinea-pig was found dead.

Pure cultures of *Bacillus pyrogenes* were obtained from all these autopsies. A complete description of them and of the tissues is reported in another place.

After searching the literature carefully I have been unable to find any organism which in the slightest degree resembles this one. Dr. Stokes called my attention to the description of an organism found in Manila, P. I., and reported by Lieutenant Maximilian Herzog. After carefully comparing these organisms, his and the one I report, I cannot find the slightest resemblance. His organism was obtained at an autopsy performed by him on an unknown native islander who was brought to the hospital dead. The patient's previous history was entirely unknown. At the autopsy the only lesions found were general glandular enlargements and an incised wound in the left leg. The liver, spleen, and kidney showed parenchymatous degeneration. The liver showed some interstitial hepatitis.

Cultures taken from the various organs, after twenty-four hours, showed no growth except that taken from the liver. The culture made from the liver grew an organism with a heavy golden-yellow pigment and exuding a fœtid cadaverous odor; hence, Dr. Herzog has called his organism (ignoring the binominal nomenclature) "*Bacillus aureus fœtidus*."

It will be easier, perhaps, to compare his organism with the one isolated by me from Prof. Preston's patient, by placing them side by side in the following table:

	<i>Bacillus pyrogenes</i> .	<i>Bacillus aureus fœtidus</i> .
Pigment	Lemon yellow	Golden yellow
Capsule	Absent	Present
Spores	Negative	Positive
Motility	Active	Absent
Size	0.6 micron to 2.1 microns	0.4 micron to 1.4 microns long
	0.5 micron to 0.8 micron	0.4 micron to 1.4 microns wide
Liquefaction	Complete in twelve hours	Absent until seventh day
Odor	None	Cadaverous
Death-point	60°	62°

To summarize, a male patient, aged thirty-six years, with a temperature lasting eight weeks, which never rose above 102°, exhibited meningeal symptoms, photophobia, tremors, irritability, subsultus tendinum, and joint involvement; the Widal reaction was constantly absent; there was a leukocytosis of 14,000. Cultures taken from his blood revealed a lemon-yellow diplobacillus pathogenic for guinea-pigs and rabbits, negative to Gram's stain, actively motile, producing no indol, not liquefying gelatin until the seventh day,

and producing no gas in lactose, saccharose, or glucose media. Milk, mannite, litmus agar were acidified. The organism was killed at an exposure of 60° C. for ten minutes. It has been named *Bacillus pyrogenes*.

In conclusion, I wish to extend thanks for kind suggestions and assistance to Prof. George J. Preston, through whose generosity I was enabled to do this work; to Prof. Wm. H. Welch, for naming the organism, and especially to Prof. Wm. Royal Stokes, for much assistance.

**CERTAIN REMOTE CONSEQUENCES OF INFECTIONS OF THE
BILIARY TRACT, WITH SPECIAL REFERENCE TO, (1) CHOLELITHIASIS AND CHOLECYSTITIS, (2) ADHESIONS OF
THE UPPER ABDOMEN, (3) THE GENERAL PRINCIPLES OF TREATMENT, AND (4) THE INDICATIONS FOR SURGICAL INTERVENTION.¹**

By A. O. J. KELLY, M.D.,

ASSISTANT PROFESSOR OF MEDICINE IN THE UNIVERSITY OF PENNSYLVANIA AND ASSISTANT PHYSICIAN TO THE UNIVERSITY HOSPITAL; PROFESSOR OF THE THEORY AND PRACTICE OF MEDICINE IN THE UNIVERSITY OF VERMONT; PROFESSOR OF PATHOLOGY IN THE WOMAN'S MEDICAL COLLEGE OF PENNSYLVANIA; PATHOLOGIST TO THE GERMAN HOSPITAL, AND PHYSICIAN TO ST. AGNES' HOSPITAL, PHILADELPHIA.

In discussing the more immediate consequences of infection of the biliary tract,² I mentioned that virulent bacteria and definite anatomical lesions may persist in the gall-bladder for years, and that such subacute or chronic, insidious, and long-standing infections play a major role in the etiology of gallstones, cholecystitis, pericholecystic adhesions, and the divers symptoms commonly but often erroneously ascribed to disorder of the stomach.

**THE INFECTIOUS NATURE OF CHOLELITHIASIS, CHOLECYSTITIS,
AND THEIR COMPLICATIONS.**

In asking your attention now to a discussion of the infectious nature of gallstones and the entire cholelithitic process, it is not my intention to review in detail the manner of formation of gallstones; this was done some years ago by the master hand of Naunyn. But I may point out briefly the accepted opinions on the subject.

There is general agreement that the one necessary factor in the

¹ Part II of the Mutter Lecture of the College of Physicians of Philadelphia, delivered December 3, 1905. Part I of the Lecture, entitled "Infections of the Biliary Tract, with special Reference to Latent (or Masked) and Typhoid Infections," was published in the *AMER. JOUR. MED. SCI.*, September, 1906, cxxxii, 446.

² Part I of this Lecture, *loc. cit.*

causation of gallstones is a low-grade catarrhal inflammation of the biliary tract; the second requisite seems to be some obstruction to the free flow of bile. The one without the other factor is not sufficient; whether a third factor is of significance remains to be determined. In consequence of bacterial infection of the biliary tract a low-grade catarrhal inflammation is set up; this, on the one hand, leads to obstruction to the free flow of bile from swelling of the mucous membrane, and the products of this inflammation, on the other hand, contain the essential constituents of gallstones. In the gall-bladder (the seat of formation of most gallstones) the catarrhal inflammation leads to desquamation of the lining epithelium, an albuminous exudation, and an increased formation of mucus and of cholesterin; and in the gall-bladder dynamic factors doubtless frequently favor the stagnation of bile. The increased cholesterin, then, is derived not from the bile (being according to Naunyn, independent of general bodily and diathetic conditions); it results from catarrhal disintegration of the mucous cells lining the wall of the gall-bladder. An early evidence of this increased formation of cholesterin may be seen microscopically in the so-called myelin droplets or bodies within the mucous cells. The second important constituent of the gallstones, bilirubin-calcium, is derived from the bile, being precipitated by the albuminous exudation of the inflammatory process—a phenomenon that can be imitated experimentally by adding egg albumen to normal bile. Stagnation and inspissation of the bile, to which, according to the older views, the formation of gallstones was due, do not give rise to the increased formation of cholesterin nor to the precipitation of bilirubin-calcium—whence they are contributing factors only. Bilirubin-calcium is believed by Naunyn to act as a cement substance, binding together the cholesterin, desquamated epithelium, etc.—the whole forming the nucleus of the gallstone. The exact significance of foreign bodies and of chemical substances apart from bacterial products has not yet been definitely determined. There being no cholesterin-bearing mucous membrane in the smaller bile ducts, cholesterin gallstones are not formed within the intrahepatic ducts, although by a retrograde movement they may be transported thither; bilirubin-calcium calculi only are formed in the intrahepatic ducts; but both varieties, as well as mixed calculi, are formed within the gall-bladder.

Whether infection and obstruction to the free flow of bile comprise all the necessary factors in the causation of gallstones remains to be definitely determined; but there is some reason for concurring with Herter¹ when he says: "It is plain from what has been said that there is at present no unequivocal evidence that gallstones arise from constitutional derangements unconnected with micro-organismal invasions of the gall-bladder. On the other hand, it

¹ The Etiology and Chemical Pathology of Gallstones, Trans. Cong. Amer. Phys. and Surg., 1903, vi, 158.

is certain that the cholesterin of the bile can be considerably increased by local irritants unconnected with infection, and it is likely that the requisite local conditions for such increase sometimes arise through purely metabolic disorders. While gallstones are commonly the result of local infections, we should carefully guard against the conclusion that they can never have a diathetic origin. It is at least highly probable that diathetic conditions are capable of so altering the composition of the bile as to favor materially the production of calculi in the presence of suitable local bacterial activities."

Beer¹ also has recently suggested that a third factor which, he says, may be called altered liver metabolism or a diathesis, may be of significance in the etiology of gallstones. He believes that Naunyn's factors, stagnation of bile and inflammation of the biliary passages, do not seem to be sufficient in themselves to lead to gallstone formation, even though the time allowed for the working of the causes be adequate, and that these factors lead to gallstones only in persons who previously have had gallstones.

For the present, however, I am content to point out that in at least the very great majority, if not in all cases, gallstones have a micro-organismal origin, that they arise in consequence of infection of the biliary tract. What, however, is of even greater importance is the role that bacteria play in the secondary infections following the formation of gallstones.

The consequences of gallstone activity may be mechanical or inflammatory or both. The mechanical consequences follow what may be designated wandering of the stone into and through the biliary passages. In consequence of this activity, the gallstone may set up mechanical effects in the gall-bladder, in the cystic duct, in the hepatic duct, in the common bile duct, in the diverticulum of Vater, or in the intestine. These effects are of great variety and of varying importance. Probably the most important and serious comprise permanent complete obstruction of the common bile duct, with consequent permanent jaundice, dilatation of the bile ducts, and final biliary cirrhosis of the liver. Of only less importance are the dragging sensations and discomfort attendant upon the weight of many gallstones in a distended gall-bladder; the gradual production of a Riedel's or a linguiform lobe of the liver; the effects of pressure on adjacent organs; complete obstruction of the cystic duct which, as a rule, leads at first to some distention of the gall-bladder, but soon to absorption of the bile and its replacement by mucus (hydrops) and gradual shrinkage of the gall-bladder, etc. These and other mechanical consequences of gallstone activity, however, especially incomplete obstruction of the ducts, acquire their major importance from the opportunity that they afford for bacterial infection; in fact, they invite such infection, and the infection is usually a concomitant condition.

This infection of the biliary tract is of the utmost significance, and forms an integral part of what is commonly designated calculous cholecystitis and cholangitis. The phenomena may develop (1) acutely, without preceding clinical signs referable to the gall-bladder; (2) subacutely, and (3) chronically. The ensuing pathological lesions are of the greatest diversity: Thus, for instance, gallstones may or may not be present, and the concomitant inflammatory phenomena may be of varying grades—from the mildest catarrhal lesions to widespread phlegmonous and ulcerative processes that may lead to perforation or gangrene of the gall-bladder; gallstones, if present, may be quiescent or active; they may be present in the gall-bladder, or in any one of the ducts, or in all the ducts, or in the ducts and not in the gall-bladder; they may cause an acute or chronic, partial or complete, temporary or permanent, obstruction of the cystic, the hepatic, or the common bile ducts, and, on the other hand, such obstruction may occur in the absence of gallstones (being due to swelling of the mucous membrane, kinking of the ducts, or obstruction from without), and in the presence of gallstones the ducts may be partially or completely patulous; the gall-bladder may be distended or contracted, its walls thinned or much thickened, and its lumen ultimately may become almost if not quite obliterated; it may contain bile, mucus, blood, or pus, or combinations of these, in addition to or in the absence of gallstones; adhesions may form between the gall-bladder and adjacent structures (the liver, the stomach, the duodenum, the colon, the omentum, etc.), and by way of the adhesions, the gallstones may rupture into the gastrointestinal tract and sometimes cause intestinal obstruction; or purulent pericholecystitis and pericholangitis, localized or generalized peritonitis, pyelephlebitis, pericholangitic abscesses of the liver, fistulae, acute and chronic pancreatitis, etc., may ensue; and finally, in some cases a general bacterial, often pyococcic, infection, with or without multiple abscesses, may develop.

All of these pathological lesions were well exemplified in the 216 cases under review. It is not pertinent at present to give a detailed statement of all the lesions, but reference to some of them may be of interest. Thus:

Of 216 patients, 182 (84.2 per cent.) had gallstones, and 34 (15.8 per cent.) had no gallstones.

Of 182 patients that had gallstones, 101 (55.5 per cent.) had stones in the gall-bladder alone; 23 (12.5 per cent.) had stones in the gall-bladder and cystic duct; 19 (10.5 per cent.) had stones in the gall-bladder and common duct; 12 (6.6 per cent.) had stones in the common duct alone; 11 (6.0 per cent.) had stones in the cystic duct alone; 5 (2.8 per cent.) had stones in the gall-bladder, cystic, hepatic, and common ducts; 4 (2.2 per cent.) had stones in the gall-bladder, hepatic, and common ducts; 1 (0.6 per cent.) had stones in the gall-bladder, cystic, and common ducts; 2 (1.1 per cent.) had

stones in the adhesions (not otherwise specified); and 4 (2.2 per cent.) had stones in the regions not definitely specified.

Of 216 patients, 58 had no stones in the gall-bladder, and of these, 23 had stones in the ducts. 41 had stones in the common duct, and of these, 12 had stones nowhere else. 9 had stones in the hepatic ducts (as well as elsewhere).

Of 216 patients, 123 (56.9 per cent.) had adhesions about the gall-bladder; 22 (10.1 per cent.) had no adhesions; and of 71 (33.0 per cent.) there is no note in the case-history of the presence or absence of adhesions (probably none were present).

The mechanical and the inflammatory phenomena attendant upon gallstones may occur concurrently or alternately, and they give rise in consequence to a most complex and variable symptomatology. It is altogether without the province of this lecture to discuss this symptomatology in detail, but several of the clinical manifestations of these remote consequences of infections of the biliary tract, as exemplified by the 216 patients under review, may be mentioned: (1) The pains; (2) the jaundice; (3) the size of the gall-bladder; and (4) the accompanying fever.

THE PAINS. Of 216 patients, 161 (74.5 per cent.) had colicky pains; 45 (20.8 per cent.) had non-colicky pains; 7 (3.3 per cent.) had pain not accurately described; and 3 (1.4 per cent.) had no pain whatever (one was markedly jaundiced, and the other two had fever, 100° and 104.6° F. respectively).

Of 161 patients that had colicky pains, 137 (85.1 per cent.) had gallstones, and 24 (14.9 per cent.) had no gallstones.

Of 45 patients that had non-colicky pains, 35 (77.7 per cent.) had gallstones, and 10 (22.3 per cent.) had no gallstones.

Of 3 patients that had no pains whatever, 2 had gallstones. 15 patients never had colicky pains or jaundice, and of these 12 had gallstones, and 3 had no gallstones.

In seeking a rational explanation of the pains of gallstones, several facts stand in relief: (1) That gallstones are present in very many subjects and are commonly believed not to cause noteworthy symptoms; (2) that symptoms having once occurred are exceedingly likely to recur; and (3) that symptoms are often paroxysmal and very severe. It is desirable for us to inquire, in the first place, whether it is really true that only a very small percentage of gallstone subjects (commonly estimated at 5 per cent.) manifest no noteworthy symptoms; and, in the second place, we have to explain why a quiescent stone becomes active—why a gall-bladder that for years has harbored a stone or stones suddenly occasions symptoms; and why the symptoms are often paroxysmal and very painful. As regards the presumed symptomless course of cholelithiasis in many subjects, I need only emphasize the fact now well known to surgeons, but less widely acknowledged by some general practitioners, that the congeries of symptoms commonly denominated “stomach trouble,”

"indigestion," etc., are due in many cases to disease of and about the biliary tract. In a number of cases in which gallstones are an accidental finding at the necropsy, investigation of the past history of the patient reveals many and often long-continued attacks of "indigestion" (epigastric distress, anorexia, flatulence, eructations, nausea, vomiting, etc.); the stomach is often normal—in which event, the gallstones and possibly pericholecystic adhesions, rather than being accidental, serve to explain the clinical symptoms. As practising physicians, it behooves us to be on the alert to recognize disease of the biliary tract in the absence of jaundice and gallstone colic, and we must renounce the tenet that gallstones in the great majority of cases cause no symptoms; they do cause symptoms—symptoms, however, referable often to the stomach rather than to the biliary tract.

As regards the pains of cholecystitis, the weight of evidence at hand strongly supports the opinion that an active infection of the biliary tract, that is, a cholecystitis or cholangitis, is the factor in provoking activity where quiescence formerly reigned. As is well known, the pains may be local or referred, or both, and the local pain may be colicky or non-colicky. Although there is some discussion as to the cause of the colicky pain, there is little or no objection to attributing the non-colicky pain to inflammatory phenomena provoked by infection, inflammation of and about the gall-bladder and biliary ducts. The dull aching pains are with excellent reason ascribed to inflammatory changes in the gall-bladder with the exudation of inflammatory products, and consequent distention; the more acute pains, associated with muscular rigidity, tenderness, etc., are due to concomitant infection of the regional peritoneum—which as it subsides occasions peritoneal adhesions, a contributing factor in the dull aching pains, and of other significance to be presently mentioned. We must bear in mind, however, that some considerable distention of the gall-bladder is possible without provoking noteworthy pain—provided the cystic and the common ducts are patulous. I have seen altogether painless, though much enlarged and somewhat tender, gall-bladders in the course of typhoid fever. It is to a similar cause, that is, efficient drainage, that the comparatively symptomless course of some cases of cholelithiasis is to be attributed, although the absence of inflammatory phenomena in the wall of the gall-bladder and the ducts, and the absence of pericholecystic adhesions, are also of significance. As regards the referred pains (epigastrium, subscapular region, the neck, the shoulder, the arm, etc.), although the sympathetic nerve is of significance, the demonstration that filaments of the pneumogastric nerve are distributed to the gall-bladder serves to explain the common association of gastric and cardiac symptoms with disease of the biliary tract; and the frequent occurrence of pain, sometimes of actual colic, three or four hours after a meal suggests a causal relationship to

the normal physiological contraction of the gall-bladder induced by the entrance of the chyme into the intestine.

As regards the colicky pains, I am firmly of the opinion that heretofore we have been too much concerned with interpreting them as evidence of the passage of a gallstone through the biliary ducts; pains of like character may doubtless be due to different factors—which have been well pointed out by Riedel, who gives the following as the causes of gallstone colic: (1) Adhesions of a gall-bladder no longer containing stones; (2) adhesions when large stones are present in the gall-bladder and the cystic duct is patent; (3) inflammatory processes in a gall-bladder distended by fluid or stones, when the cystic duct is occluded by inflammation or by the presence of a stone in the neck of the gall-bladder; (4) the transit of a stone through the bile passages; and (5) the inflammation of a dilated, calculous common duct, or its tributaries, without impaction of the stone.

There can be little doubt that in a number of cases the spasmodic efforts of the gall-bladder and the common duct to expel their contents by vigorous contraction of their muscular coats are the cause of the peculiar gallstone colic. This pain occurs in its greatest intensity during the transit of a stone through the ducts, and it ceases as the stone is discharged into the intestine or drops back into the gall-bladder—thus freeing the cystic duct. But there can also be little doubt that attacks of pain indistinguishable from those provoked by the transit of a stone may be due to other factors—those mentioned above; although in some instances the attacks of pain may not be as severe as those of a so-called true gallstone colic. This pain may be likened to that provoked by the efforts of other hollow viscera, such as, the appendix, the intestine, the ureter, the urinary bladder, the Fallopian tube, etc., the contractions of which designed to expel their contents against an obstruction are very painful; and, in the case of the gall-bladder, as well as of these other viscera, if the obstruction be incomplete, hypertrophy of the muscular coat results, and often later lessening of the size of the cavity, whereas, if the obstruction be complete, paresis of the muscular coat soon occurs, dilatation ensues, and the pain subsides. But, as exemplified by the 216 patients under review, gallstones are absent in 15.5 per cent. of the patients who have colicky pains, and they are present in 77.7 per cent. of the patients who have only non-colicky pains.

Furthermore, as is well known, gallstones may be passed by the bowel, that is, they may ulcerate into the bowel, forming a fistula, without colicky pains having ever been experienced by the patient. As regards the cause of the colic, I believe that, although mechanical factors, such as traumatism, joltings, etc., may sometimes be the immediately provoking factor, it results in the great majority of cases from infection and consequent inflammation; that is, cholecystitis provokes activity, as it were sets the stone in motion; and that

when no stone is present the increasing tension within the gall-bladder and the spasmodic efforts to empty itself cause the pain. We should, therefore, interpret the great majority of gallstone colics, not as evidence of the passage of a stone through the biliary ducts, but as evidence of an acute cholecystitis. A fact tending to support this view is that as the inflammation subsides the stones become quiescent; indeed, the one hope of medical treatment is to cause subsidence of the infection and inflammation.

THE JAUNDICE. Of 216 patients, 138 (63.9 per cent.) had jaundice at some time or other; 74 (34.2 per cent.) never had jaundice; and of 4 (1.9 per cent.) there is no statement as to the occurrence of jaundice. 54 (14.0 per cent.) had jaundice at operation and previous attacks; 13 (6.0 per cent.) had jaundice at operation and no previous attacks; 67 (31.0 per cent.) had previous attacks of jaundice but no jaundice at operation; and 4 (1.9 per cent.) had jaundice at operation, but there is no note as to whether or not there were previous attacks. 71 (32.8 per cent.) had jaundice at operation; 141 (65.3 per cent.) had no jaundice at operation; 121 (56.0 per cent.) had attacks of jaundice prior to the time of operation. 116 (53.7 per cent.) had jaundice and gallstones; 21 (10.0 per cent.) had jaundice, but no gallstones; 60 (27.7 per cent.) had gallstones, but no jaundice; 11 (5.0 per cent.) had no jaundice and no gallstones; and in 8 (3.6 per cent.) there is no statement as to the association of jaundice and gallstones. 12 (5.5 per cent.) had jaundice and colicky pains, but no gallstones.

Of 60 patients who had gallstones but no jaundice, 44 (73.3 per cent.) had colicky pains; 12 (20.0 per cent.) had non-colicky pains; and in 4 (6.7 per cent.) the character of the pain is not accurately described.

Of 11 patients who had no jaundice and no gallstones, 8 (72.7 per cent.) had non-colicky pains, and 3 (27.3 per cent.) had colicky pains.

Of 34 patients that had no gallstones, 12 (35.3 per cent.) had no jaundice at operation, but did have previous attacks; 11 (32.4 per cent.) never had jaundice; 9 (26.5 per cent.) had jaundice at operation and previous attacks; 1 (2.9 per cent.) had jaundice at operation, but no previous attacks; and in 1 (2.9 per cent.) there is no statement as to the occurrence of jaundice.

In a general way we may say that jaundice may be due to one of two factors: (1) Mechanical obstruction of the biliary passages, and (2) some disturbance in the bile-secreting function of the liver. The mechanical obstructions comprise (1) those due to a gallstone; (2) those due to inflammatory swelling of the lining of the biliary ducts, and (3) those due to compression of the common duct or of the extrahepatic part of the hepatic duct by a large stone in the cystic duct, swollen lymph glands, regional tumors, inflammatory exudations, adhesions, kinking of the ducts, etc. We may, therefore,

speak of a lithogenous jaundice, an inflammatory (or infectious jaundice) and a compression jaundice—ill-advised as these terms may be on some occasions. The practical deductions to be drawn from the known facts are (1) that in some cases of cholelithiasis jaundice is not due to obstruction of the ducts by a stone, but rather to infection, inflammatory swelling of the ducts, and (2) that in many cases of cholelithiasis jaundice does not occur at all, although other important and distressing symptoms may be quite obtrusive. Of the 216 patients under review, 74 (34.2 per cent.) never had jaundice; 141 (65.3 per cent.) had no jaundice at the time of operation, whereas 121 (56 per cent.) gave a history of attacks of jaundice prior to the time of operation. These, in some cases, antedated the operation many years; in some cases long periods of freedom from jaundice followed; in some cases there were no subsequent attacks of jaundice whatever. Remembering, then, that jaundice may be entirely absent, and that when it occurs, it may be late, inconsistent, and inconspicuous, we should train ourselves to recognize cholecystitis and cholelithiasis in the absence of jaundice—and of gallstone colic.

THE SIZE OF THE GALL-BLADDER. Of 216 patients—in 88 (40.7 per cent.) the gall-bladder was enlarged; in 9 (4.1 per cent.) the gall-bladder was normal in size; in 32 (15.0 per cent.) the gall-bladder was small and atrophic; and in 87 (40.2 per cent.) the size of the gall-bladder is not mentioned in the case-history.

Of 88 patients in whom the gall-bladder was enlarged, 74 (84.0 per cent.) had gallstones, and 14 (16.0 per cent.) had no gallstones. 49 (55.6 per cent.) had jaundice, 36 (41.0 per cent.) had no jaundice, and in 3 (3.4 per cent.) the presence or absence of jaundice is not mentioned.

Of 9 patients in whom the gall-bladder was normal in size, 7 (77.7 per cent.) had gallstones, and 2 (33.3 per cent.) had no gallstones. 7 (77.7 per cent.) had jaundice, and 2 (33.3 per cent.) had no jaundice.

Of 32 patients in whom the gall-bladder was small and atrophic, 30 (93.7 per cent.) had gallstones, and 2 (6.3 per cent.) had no gallstones, but did have fistulae. 25 (78.1 per cent.) had jaundice, and 7 (21.9 per cent.) had no jaundice.

Of 87 patients in whom the size of the gall-bladder is not mentioned, 71 (81.6 per cent.) had gallstones, and 16 (18.4 per cent.) had no gallstones. 57 (65.4 per cent.) had jaundice, 29 (33.4 per cent.) had no jaundice, and in 1 (1.1 per cent.) the presence or absence of jaundice is not mentioned.

Of 116 patients that had jaundice and gallstones—in 47 (40.5 per cent.) the gall-bladder was enlarged, in 31 (26.7 per cent.) the gall-bladder was small and atrophic, in 4 (3.5 per cent.) the gall-bladder was normal in size, and in 34 (29.3 per cent.) there is no mention of the size of the gall-bladder.

Of 60 patients that had gallstones, but no jaundice—in 29 (48.3 per cent.) the gall-bladder was enlarged, in 10 (16.7 per cent.) the gall-bladder was small and atrophic, in 2 (3.3 per cent.) the gall-bladder was normal in size, and in 19 (31.7 per cent.) there is no mention of the size of the gall-bladder.

Of 21 patients that had jaundice but no gallstones—in 8 (38.1 per cent.) the gall-bladder was enlarged, in 3 (14.3 per cent.) the gall-bladder was small and atrophic, in 2 (9.5 per cent.) the gall-bladder was normal in size, and in 8 (38.1 per cent.) there is no mention of the size of the gall-bladder.

Of 11 patients that had neither jaundice nor gallstones—in 7 (63.3 per cent.) the gall-bladder was enlarged, in 3 (27.3 per cent.) the gall-bladder was small and atrophic, and in 1 (9.0 per cent.) the gall-bladder was normal in size.

Of 47 patients that had jaundice, gallstones, and enlargement of the gall-bladder—in 26 gallstones were present in the gall-bladder alone; in 5, gallstones were present in the gall-bladder and cystic duct; in 5, gallstones were present in the gall-bladder and common duct; in 4, gallstones were present in the cystic duct alone; in 4, gallstones were present in the common duct alone; in 2, gallstones were present in the gall-bladder, hepatic and common ducts; in 1, gallstones were present in the gall-bladder, cystic, hepatic, and common ducts.

Of 31 patients that had jaundice, gallstones, and a small and atrophic gall-bladder—in 10, gallstones were present in the gall-bladder alone; in 7, gallstones were present in the common duct alone; in 8, gallstones were present in the gall-bladder and common duct; in 2, gallstones were present in the gall-bladder and cystic duct; in 2, gallstones were present in the cystic duct alone; in 1, gallstones were present in the adhesions (not otherwise specified); in 1, gallstones were present in the gall-bladder, hepatic and common ducts.

Of 4 patients that had jaundice, gallstones, and a gall-bladder normal in size—in 3, gallstones were present in the gall-bladder alone, and in 1, gallstones were present in the gall-bladder and common duct.

Of 29 patients that had gallstones and enlargement of the gall-bladder, but no jaundice—in 24, gallstones were present in the gall-bladder alone; in 3, gallstones were present in the gall-bladder and cystic duct; and in 2, gallstones were present in the cystic duct alone.

Of 10 patients that had gallstones and a small and atrophic gall-bladder, but no jaundice—in 9, gallstones were present in the gall-bladder alone, and in 1, gallstones were present in the adhesions (not otherwise specified).

Of 2 patients that had gallstones and a gall-bladder normal in size, but no jaundice—in 1, gallstones were present in the gall-bladder alone, and in 1, gallstones were present in the gall-bladder and cystic duct.

Of 34 patients that had no gallstones—in 14, the gall-bladder

was enlarged; in 2, the gall-bladder was normal in size; in 2, the gall-bladder was small and atrophic, and in 16, there is no mention of the size of the gall-bladder.

The clinical significance of the size of the gall-bladder has engaged the attention of physicians and surgeons for a long time, but special consideration has been given to its diagnostic importance since a knowledge of what is known as Courvoisier's law has become general. As is well known, Courvoisier, basing his opinion upon an analysis of 187 cases, stated that in cases of chronic jaundice contraction of the gall-bladder is suggestive of gallstones, and that dilatation of the gall-bladder is suggestive of biliary obstruction caused by factors other than gallstones—that is, pressure from without, most often carcinoma of the head of the pancreas. This so-called law is generally made use of nowadays in diagnosis, and serves us well in the majority of cases, although as Courvoisier himself admitted, there are some notable exceptions to its universal applicability. Unfortunately, the case-histories under review are not in all respects sufficiently detailed to permit a final statement in this particular; but it is of some interest to know that in at least 40.5 per cent. of 116 patients that had gallstones and jaundice the gall-bladder was enlarged. In somewhat more than one-half of these cases, however, the gallstones were present in the gall-bladder alone, and the associated jaundice was doubtless due to inflammatory swelling, pressure from without, etc. I would not, therefore, call into question the general trustworthiness of Courvoisier's law—of the value of which there is ample corroborative testimony—but I should suggest the value of continued study of the conditions found at operation, and emphasize the importance of basing our diagnoses upon the varying grouping of the symptoms in the different cases, rather than upon any single symptom or sign. I have studied a sufficient number of gall-bladders to convince me that Courvoisier's explanation of the shrinkage of the gall-bladder in these cases is correct: that is, that it is due to inflammatory thickening and cicatrization the consequence of repeated infection. This process requires time—whence the condition of the gall-bladder varies early and late in the disease; and that such cicatrization does occur is suggested by its presence in a number of our cases in which gallstones were present without jaundice. It is manifestly impossible that such a thickened and cicatrized gall-bladder should dilate no matter what the obstruction in the common duct. One can conceive, however, of an acute cholecystitis or empyema of the gall-bladder (with distention) and an acute impaction of a stone in the common duct (with jaundice); or of hydrops or empyema of the gall-bladder (with distention) and a large stone in the cystic duct compressing the common duct (with jaundice); or of the association of a stone in the common duct and carcinoma of the head of the pancreas—in which event the gall-bladder might be dilated, or

small, thickened, and atrophic or sclerosed. The practical inference is that, although as maintained by Courvoisier his law may hold good in 80 per cent. of cases, a patient with chronic jaundice and enlargement of the gall-bladder should not be uncerimoniously condemned to the diagnosis of carcinoma of the pancreas, but that the grouping of the other symptoms should determine the diagnosis and suggest the treatment.

THE FEVER. Of 216 patients, 143 (66.2 per cent.) had fever some time during the course of the disease; 65 (30.1 per cent.) had no fever; and in 8 (3.7 per cent.) there is no note of the presence or absence of fever.

Of 143 patients who had fever, 73 (51.0 per cent.) had gallstones and jaundice; 45 (31.5 per cent.) had gallstones, but no jaundice; 16 (11.2 per cent.) had jaundice, but no gallstones; and 9 (6.3 per cent.) had no gallstones and no jaundice.

Of 65 patients who had no fever, 42 (64.6 per cent.) had gallstones and jaundice; 14 (21.5 per cent.) had gallstones, but no jaundice; 7 (10.8 per cent.) had jaundice, but no gallstones; and 2 (3.1 per cent.) had no gallstones and no jaundice.

As regards the fever, I desire only to point that it should be correctly interpreted; that it is a manifestation of infection and is not due merely to reflex causes, nervous perturbations, etc., as was at one time thought. In many cases, concurrently with the development of the so-called gallstone colic, there is a sudden elevation of the temperature, followed sometimes by an equally sudden fall; in these cases, the onset of the fever may or may not be associated with chilliness or a definite chill. This as well as the more continuous fever of frank acute cholecystitis and the recurring paroxysmal fever, known as Charcot's biliary intermittent fever, a characteristic feature of chronic calculous disease (cholecystitis, cholangitis, cholelithiasis), are infectious in nature; whence it follows that in the clinical study of our patients we should interpret the occurrence of fever as clear evidence of infection.

NON-CALCULOUS CHOLECYSTITIS. Of the 216 patients under review, 34 (15.8 per cent.) had no gallstones.

Of 34 patients who had no gallstones, 12 (35.3 per cent.) had no jaundice at operation, but did have previous attacks; 11 (32.4 per cent.) never had jaundice; 9 (26.5 per cent.) had jaundice at operation and previous attacks; 1 (2.9 per cent.) had jaundice at operation, but no previous attack; and in 1 (2.9 per cent.) there is no statement as to jaundice. 24 (70.6 per cent.) had colicky pains; 10 (29.4 per cent.) had non-colicky pains. 21 (62.0 per cent.) had fever; 13 (38.0 per cent.) had no fever. 14 (41.2 per cent.) had a distended gall-bladder; 2 (5.9 per cent.) had a normal-sized gall-bladder; 2 (5.9 per cent.) had a small and atrophic gall-bladder, and in 16 (47.0 per cent.) there is no statement as to the size of the gall-bladder. 19 (56.0 per cent.) had adhesions; 5 (14.7 per

cent.) had no adhesions, and in 10 (29.3 per cent.) there is no statement as to the presence or absence of adhesions. 12 (35.3 per cent.) had colicky pains and adhesions; 6 (17.6 per cent.) had adhesions and non-colicky pains; 4 (11.8 per cent.) had colicky pains and no adhesions; 1 (2.9 per cent.) had non-colicky pains and no adhesions, and in 11 (32.4 per cent.) there is no note of the association of pains and adhesions.

ADHESIONS OF THE UPPER ABDOMEN.

I must now ask your attention to adhesions of the upper abdomen—in the neighborhood of the gall-bladder and the biliary ducts. These adhesions have frequently been encountered by pathologists and surgeons, but it is only recently that we are awakening to a knowledge of their full import. I have little hesitancy in confessing that in years gone by I frequently observed and commented upon the presence of such adhesions, but so little did I apprehend that they possessed noteworthy clinical significance, that I scarcely make a note of them in my necropsy protocols; recognizing their presence I was not alive to their significance. Their production is intimately associated with inflammatory phenomena of the organs of the upper abdomen—the gall-bladder, the biliary ducts, the stomach, the duodenum, etc.; but of all organs, the biliary tract is doubtless the chief offender. In most cases, these adhesions represent the sequels of past subacute and chronic, sometimes acute, inflammation of the organs hereabout, and they are thus a direct result, an expression, of infection.

The conditions are quite analogous to those in and about the vermiform appendix. Should the biliary infection be acute and virulent, the bacteria or their toxins penetrate the wall of the gall-bladder or the biliary ducts and engender a fibrinous exudation, a more or less local peritonitis. In the event of the later development of suggestive clinical symptoms, much diagnostic significance attaches to a history of such past infections (typhoid fever, definite cholecystitis, etc.).

In the subacute and chronic infections, however, the formation of adhesions goes on less obtrusively, often entirely latently—whence the symptoms that develop later are commonly misinterpreted. In consequence of milder infections the less virulent toxins give rise to less desquamation of peritoneal endothelium, to the exudation of less fibrinous lymph, and to less inflammatory phenomena sufficient, however, often to lead to more or less widespread adhesions. Frequently, these are quite localized and very delicate—gall-spiders, resembling spider webs, they have been aptly called by Morris¹; in other cases they are quite widespread and very dense.

¹ Bile Tract Adhesions, *Med. Record*, 1905, lxxvii, 447.

All gradations are encountered—from those very delicate and so slight as scarcely to occasion comment or awaken interest and possibly, though certainly not always, innocuous clinically, to others so dense and unyielding that the wonder is that the patient has been able so long to withstand their effects. Of the 216 patients under review, 123 had adhesions, 22 had no adhesions, and in 71 the presence or absence of adhesions is not mentioned (probably none were present).

The clinical recognition of these adhesions is sometimes a matter of difficulty, but is perhaps not impossible in the majority of cases. It is essential, in the first place, that we recognize that many of the cases of so-called "stomach ache," "biliousness," indigestion, gastralgia, gastritis, gastroduodenitis, persistent or recurring vomiting, constipation, etc., in reality have an anatomical basis. We now know that many of these cases are due to an unsuspected or latent gastric or duodenal ulcer, definite cholecystitis, chronic pancreatitis, etc.; in other cases, they are due to pericholecystic, perigastric, periduodenal, and pericolononic adhesions. We must study attentively patients who complain of general ill-health, with more or less ill-defined gastric or epigastric symptoms—epigastric distress and tenderness, sometimes associated with nausea and vomiting, and perhaps constipation. Attacks of such symptoms may come on periodically without definite cause; they may last a few days, and cease quite as causelessly. Now and then the attack may be ushered in with chilliness (rarely a definite chill), and may be attended by a little fever. Examination may reveal some tenderness in the epigastrium, perhaps a little to the right of the median line, toward the region of the pylorus or the gall-bladder, and some rigidity of the overlying muscle. Deep pressure is sometimes very painful. Later, should the pylorus or the duodenum become obstructed, the commoner manifestations of dilatation of the stomach supervene; but these need not detain us now, since I am more interested in the latent, masked, and unsuspected cases. Especial diagnostic importance attaches to intractability of the symptoms and a history of past infection of the biliary tract (typhoid fever, cholecystitis, cholangitis, jaundice, etc.). In the event of suspecting such adhesions, we must exclude other factors that may cause similar symptoms, remembering, however, that in many cases symptoms supposedly due to disease of the stomach or intestine are due disease of the gall-bladder or adhesions of the upper abdomen.

THE GENERAL PRINCIPLES OF TREATMENT.

The intelligent treatment of any patient presupposes a clear conception of (1) the pathology of the disease in question, of its pathological anatomy, and its natural tendencies; and (2) of the

means of treatment at our command and the objects attainable by their use. Of these none is more important than a knowledge of the natural history of the disease. To attempt by internal medication to dissolve a gallstone that is insoluble; to cause the passage through the gall ducts of a gallstone when the ducts are impassable to a stone of its size; to attempt to cure supposed gastric symptoms by measures directed to the stomach when the cause of the symptoms is adhesions about the gall-bladder, and to cause the solution of these adhesions when, perchance, they have been diagnosed—is as futile as it is irrational.

In view of the frequency of gallstones in infections of the biliary tract they may well be included in a consideration of the indications for treatment. The main indications may be said to be: (1) To cause solution of the stone or stones; (2) to cause the discharge of the stone or stones; and (3) to treat the complicating infection.

SOLUTION OF THE GALLSTONES. As regards the solubility of the gallstones Naumyn¹ states that we have to consider cholesterin, bilirubin-calcium, calcium carbonate, and calcium phosphate. Of these, bilirubin-calcium and the inorganic salts of calcium are insoluble in the bile; cholesterin, however, is quite soluble in the bile, and even in conditions of disease the bile scarcely if ever contains so much cholesterin that it cannot take more in solution. We have, therefore, to admit the possibility of cholesterin stones being dissolved. In fact, there is some experimental evidence that goes to prove that not only *in vitro*, but also *in vivo*, cholesterin stones may be dissolved. Naumyn quotes Labes' experiments of thirty years ago, in which he introduced gallstones into the gall-bladder of dogs and, killing the animals two months later, found that partial solution of the stones had occurred. Recently, Bain² has published the results of some studies that show the same possibility. In these experiments, however, the calculi were introduced into normal gall-bladders (or, as in one or two of Bain's experiments, into gall-bladders in which a cholecystitis has been artificially produced). The conditions are quite different in the human subject affected with gallstones—in which we have to deal not only with the stones, as such, but also with the subacute or chronic lithogenic catarrh—the direct cause of the gallstone formation. It is thus exceedingly doubtful whether spontaneous solution of gallstones ever occurs in the human subject—indeed, whether it is at all possible. Naumyn states that in studying one thousand cases of cholelithiasis he has seen trustworthy evidence of the solution of the stone in perhaps ten cases (1 per cent.). Though he does

¹ Zur Naturgeschichte der Gallensteine und zur Cholelithiasis, Mith. Grenzgeb. Med. u. 1905, xiv, 537.

² An Experimental Contribution to the Treatment of Cholelithiasis, Brit. Med. Jour., 1906, ii, 269.

not deny that the solvent action of the bile may be a contributing factor in the process, he inclines much more to the belief that the disintegration of the stone is due to the action of bacteria, and for the reasons—that he has found this disintegration, not in cases of a single stone, but in cases of numerous stones; that the process involved many stones; that the solution was not circumferential, as it would be in the event of solution in a dissolving menstruum, but was circumscribed at the periphery and extended deep into the calculi; and that the disintegration went hand-in-hand with the deposition in the stones of inorganic calcium (phosphates and carbonates), certainly due to bacterial activity. The reasons for the non-occurrence of solution of the stones are, (1) and most important, the fact that on account of the presence of the stones the activity of the walls of the gall-bladder is compromised, it cannot empty itself completely (a certain amount of residual bile is always present), and the desirable irrigation of the gall-bladder with fresh bile (the solvent menstruum) does not occur; and (2) the fact that on account of the associated catarrh of the biliary tract the bile contains more cholesterol than is normal, and thus takes up an additional increased amount with less avidity.

Naunyn furthermore points out that even should it be possible to cause disintegration of the stones in the gall-bladder, it is exceedingly doubtful how much good would be thereby accomplished—since in this event the residual particles of the disintegrated calculi would remain in the gall-bladder, and form the nucleus of new calculi. These are formed by the cementing together or incrustation of the disintegrated particles by newly precipitated bilirubin-calcium, the formation of which is favored by the persisting infectious inflammation of the mucous membrane which gives rise to a secretion rich in calcium.

This reasoning is well borne out by clinical experience, since it is exceedingly doubtful whether, with any means at our command, we can cause solution of gallstones in the gall-bladder. We now know that the thousands of gallstones said to have been passed by the bowel after the administration of olive oil are merely masses resembling gallstones in outward appearances and due to the basely deceptive powers of the olive oil acquired in its passage through the intestinal tract. We must conclude, then, that the solution of gallstones is scarcely the object of rational treatment.

DISCHARGE OF THE GALLSTONES. Gallstones may be discharged from the biliary tract *per via naturalis*, or by way of fistulae. Many stones rarely pass *per via naturalis*, though single stones sometimes do; large stones, if discharged, practically always leave the gall-bladder by devious tracts and the formation of fistulae. This is part of the natural history of the disease. In some cases the gallstones have been entirely latent until they appear in the stools, in which event if the stone is large, we must assume the formation

of a gall-bladder-colonic fistula, since large stones having ulcerated into the small intestine practically always cause noteworthy symptoms in their downward passage, and not infrequently even fatal intestinal obstruction. In the event of a single stone only being present, the possibility of cure is thus presented, but the possibility is too remote for serious consideration. It is an occurrence which should not be hoped for, nor awaited, nor sought by medical means, even were such at our command; it also then cannot be considered an object of rational treatment.

TREATMENT OF THE BILIARY INFECTION. There remains as an indication for treatment—the biliary infection. It has been well emphasized by many writers that the one worthy object of internal medication in cholelithiasis is to restore the latency from which the gallstones have been awakened, in other words, to control the infection at the basis of gallstone activity. This must also be the object of medicinal or internal treatment in the absence of gallstones. The infection of the biliary tract is what the physician has to treat. If I have pointed out that he cannot expect to dissolve the calculi nor to cause their discharge *per via naturalis* or by way of fistula-formation, I do not mean to suggest that the physician is hopeless in the presence of calculous and other disorders of the biliary tract. Unquestionably he can do a very great deal of good; in many cases lead his patient into a condition of virtual cure, that is, latency, or sterility of the biliary tract; but he must also recognize his limitations, and by a judicious balancing of his abilities and limitations not subject his patient too long to a useless medicinal treatment when early surgical intervention may restore him to health, whereas delayed it may not only add to the miseries of a miserable existence, but actually hasten the final termination.

Time forbids that I discuss in detail the medicinal treatment of infections of the biliary tract, or that I point out the manner whereby the use of Carlsbad (and other similar) waters, salicylic acid preparations, the iodides, podophyllum, and other cholagogues, certain antispasmodics, etc., do good in many cases; but I may state that the favorable result of medicinal treatment in the vast majority of cases by no means indicates the cure of the disease, but merely the restoration of latency, and this, of course, is by no means an undesirable achievement. By promoting the free flow of bile we may effect the discharge of infecting bacteria and their toxins from the biliary passages and prevent their ascent to the smaller ducts, and by the constant irrigation thus produced, as well as by other measures, we may allay the inflammatory phenomena. Ultimately, the biliary tract may be rendered sterile, and should the inflammatory phenomena subside completely a condition of latency, quiescence of the gallstones, results. In rare cases this latency is permanent, and the patient experiences no further complaints. In most cases a low-grade chronic catarrh of the gall-

bladder persists; in other cases the gall-bladder being a *locus minoris resistentiæ* readily again becomes infected, and the patient in consequence is continuously or intermittently ill. Should gallstones be passed by the bowel, we must remember that all the gallstones harbored by the patient are seldom, if ever, thus passed, and that even were this the case the persisting catarrh of the gall-bladder is quite certain to give rise to the formation of new stones. A knowledge of the natural history of calculous disease, thus, demonstrates to us unequivocally the objects and the limitations of rational medicinal treatment.

INDICATIONS FOR SURGICAL INTERVENTION.

Ap[ro]pos of surgical treatment, I may say that by means of a well-timed and properly executed operation, we may remove the gallstones and control the concomitant catarrh; that is, having removed the stones, the infectious catarrh, the cause of the stones, may be controlled and finally cured, and the formation of new stones prevented.

The important question to decide is, When should an operation be undertaken? I am by no means prepared to say that the diagnosis brings with it the indication for surgical intervention. The multiplicity of the pathological lesions and of the clinical manifestations, and their course uninfluenced by operation; the general health of the gallstone subject; the hazard of an operation *per se*; and the personal inclinations of the patient often give us pause.

In many cases the question of early operation scarcely admits of discussion. These are cases in which there is acute cholecystitis (with or without cholangitis—jaundice), with evidences of severe infection, and in which the symptoms and local signs, instead of abating, become more pronounced: these comprise cases of acute cholecystitis developing during or after an attack of typhoid fever or other infectious disease, as well as during the course of previously latent or manifest cholelithiasis, cases in which the diagnosis of severe suppurative or gangrenous cholecystitis with perforation of the gall-bladder or severe local or generalized peritonitis, seems warranted, and in which impending if not actual infection of the hepatic ducts is not unlikely. The risk attending the progress of the disease in such cases is more than the hazard of the operation; indeed, without operation many of these cases would unquestionably soon terminate fatally. Happily, however, most of the acute infections of the biliary tract subside spontaneously or under the beneficent influence of wisely directed medicinal treatment, even many of those that develop very suddenly and in which the outlook during the first twelve or twenty-four hours seems fraught with danger. In general, it is much wiser that the acute manifestations

should subside without operation—which, should it be deemed desirable later, with a view to relieve the basic condition, may then be undertaken with much more reasonable hope of ultimate success.

Immediate operation is imperative also in the event of acute intestinal obstruction in a cholelithic subject, or in a person in whom adhesions have been suspected.

Operation, though not necessarily always immediate, is indicated in all cases of persistently enlarged gall-bladder—whether the enlargement is due to simple hydrops (serous and mucous fluid), empyema (pus), or gallstones.

The question of when to operate in cases of gallstones that have become or have been active must be decided in each individual case; but one should bear in mind that, as a rule, it is not the many stones in the gall-bladder that do the most damage, but the one or two stones that get into the ducts, that the special risk attending operations for gallstones increases with delay, and that whereas gallstones are readily removed from the gall-bladder, their removal from the ducts is commonly attended by serious difficulties and is sometimes impossible. The time of election for operation, therefore, is before the stones have entered the ducts. This is by no means always possible, nor indeed desirable. Thus, I should not advise the removal of stones that are and always have been quiescent. If, however, the gall-bladder is enlarged, and the stones have given warnings of discontent with their hampered quarters—local discomfort and distress—operation should be undertaken. Nor would I insist upon operation after a single, short, successful gallstone colic (so-called), but I should by no means be averse to it. I should bear in mind that some patients have only a single gallstone colic, but that the majority have many attacks. Personally, however, I am inclined to believe that one severe attack would be sufficient for me, and that having recovered from it I should seek the services of a skillful surgeon. Two, certainly three attacks, I believe, should be looked upon as a positive indication for operative intervention. In the event of hesitation on the part of the patient the pathological changes and the likely course of the disease should be explained to him in simple language, and he should be required to make the decision for or against operation and to assume the responsibility.

In impaction of a gallstone with chronic jaundice operation is called for, and my conviction is for early rather than delayed intervention. As I have said, the risk of gallstone operations is the risk of delay, since with delay serious infections of the biliary tract supervene (with the characteristic intermittent fever, etc.), the tendency to pronounced hemorrhage increases with the persistence of the jaundice, the general nutrition of the patient fails, he becomes less able to withstand the vicissitudes of the operation, and stagnation of the bile leads to dilatation of the ducts and seriously

compromises the functional activity of the liver cells. The decision as to the time of operation must be made for each individual patient, but I can scarcely conceive of any advantage commonly attending a delay beyond one or two weeks, and this, too, in full knowledge of the fact that some patients have recovered without operation after a much longer period.

Finally, operation is indicated in those obscure cases usually diagnosed indigestion, biliousness, gastralgia, recurring vomiting, etc., in which with reasonable certainty the presence of pericystic, perigastric, or periduodenal adhesions may be surmised.

In each of the foregoing classes of cases, operative measures attain that which is impossible of attainment, or attainable only with difficulty, slowly, and imperfectly, with medicinal measures—whence surgical measures find their justification. They find additional justification in the fact that early intervention tends to prevent the development of certain complications and sequels, such as extensive adhesions, fistulæ, carcinoma of the gall-bladder, acute and chronic pancreatitis, etc. An operation, however, should not be lightly undertaken in persons suffering with divers disorders of nutrition, such as gout, obesity, so-called chronic rheumatism, diabetes, etc.; nor in those with faulty kidneys, lungs, heart, etc.; the risk attending the anesthesia and the shock of the operation is too great and the recuperative power of the patient too much reduced, to expect from operation a great deal more than can probably be attained by well-directed medicinal, hygienic, and dietetic treatment, aside from the fact that in the one instance the patient will remain alive though indisposed, while in the other he may be much longer dead. Finally, the fact that the operative results are not always what were hoped for, is not in itself a contra-indication to operation; on the contrary, these untoward results are often attributable rather to the fact that in many long-delayed cases the anatomical lesions are such as to be almost, if not quite, irremediable by any and all means at our command.

REVIEWS.

CLINICAL OBSTETRICS. By ROBERT JARDINE, Professor of Midwifery in St. Mungo's College. Glasgow and London: Rebman, Ltd., 1905.

THE work is essentially a clinical treatise and is peculiar for the narration to a considerable extent of interesting cases. The first section of the book is occupied with the complications of pregnancy; then follows a brief description of labor and its mechanism with the management of parturition and the puerperal period. The author then treats of the hemorrhages of pregnancy, of complications in labor and the puerperal period, obstetric operations, accidents and diseases of the newborn child, the feeding of the infant, and concludes with the statistics of thirty years' work in the Glasgow Maternity Hospital.

In treating of the pernicious nausea of pregnancy the author doubts the influence of uterine displacement in producing this condition. He accepts the theory of toxemia as most satisfactory in the present stage of our knowledge. The use of saline solutions is especially recommended. We have found in these cases especial value in the examination of the blood, as affording an index of the gravity of the patient's condition. When extensive disintegration of blood corpuscles is present with the clinical phenomena of pernicious anemia, pregnancy must be terminated at once. The author, however, seems to have relied entirely upon the clinical phenomena presented.

In dealing with nephritis during pregnancy the author has found benefit in adding to the ordinary salt solution the acetate of sodium in equal proportions with the chloride. In describing cases of pernicious anemia in pregnancy he draws attention to enlargement of the liver with hemorrhages into the parenchyma, and purpura, these indicating that toxemia of hepatic origin is the most important cause of the anemias of pregnancy.

In dealing with cardiac complications during pregnancy strophanthus in the author's cases gave especially good results as a cardiac tonic. The interruption of pregnancy is frequently demanded, and the author would accomplish this before midterm, as the heart is usually then best able to bear the strain of labor. In dealing with phthisis complicating pregnancy the author does not insist upon the termination of pregnancy in all cases. With the success

of modern methods in the treatment of tuberculosis and the inevitable progress of the disease in the mother during gestation we believe that pregnancy in tuberculous patients should be interrupted as soon as possible, whereupon the mother's chance for recovery will be greatly improved.

In conducting the second stage of labor the illustration represents the physician's hand as completely covering the perineum. In our experience this predisposes to laceration, and we believe it to be important that an inch of the perineum be left without support, the hand being placed across the pelvic floor, the anus covered with antiseptic gauze or cotton. The author would immediately close all lacerations of the perineum and pelvic floor, including the cervix if it be badly torn. He states that the cervix can be drawn down and stitches inserted easily. This coincides with our experience, and we have seen nothing but good results from the immediate closure of lacerations.

In describing the hemorrhages of the later months of pregnancy the author reports a case of induced labor in which a de Ribes' bag burst under pressure and caused separation of the placenta and severe hemorrhage. The case proved fatal, but an autopsy could not be obtained. In concealed internal hemorrhage he has found the results of the ordinary rapid delivery exceedingly bad. He believes that delivery by abdominal section promises better. In treating of rupture of the uterus, he says he has seen this accident occur in cases in which the physician failed to deliver with forceps and has then resorted to turning. In the treatment of postpartum hemorrhage he has found suprarenal extract of advantage and does not recommend the use of iron. He has also been successful in tamponing firmly the uterus and vagina. He describes and illustrates a simple apparatus for giving saline infusions. In dealing with traumatic hemorrhage after labor, the author states that some of the worst cases of hemorrhage which he has seen have followed spontaneous delivery, or version and extraction, before the cervix was fully dilated. He would immediately close the cervix after hemorrhage and also for considerable or extensive laceration without hemorrhage. In dealing with rigidity of the cervix complicating labor the author depends upon manual dilatation under chloroform or hot vaginal douches. He does not mention the use of morphine, which is very successful in many of these cases.

In treating of contracted pelves he draws especial attention to the value of palpating the pelvis with the hand. He considers the most accurate method of measuring the size of the conjugate is with the fingers or with the closed hand introduced within the pelvis. He also draws attention to the value of Walcher's position in increasing the size of the pelvis. He recognizes the value of the Cesarean operation in dealing with contracted pelves, but in cases in which version and forceps are permissible he would use version in posterior parietal

presentations, reserving the use of forceps for anterior parietal presentations. He draws attention to injury to the child occurring from delivery in contracted pelvis through pressure upon the cranium. In selecting operation in disproportion between the head and the forceps he would try forceps in Walcher's position. Failing this, with the child in good condition, he would employ symphyseotomy. In subsequent labors pregnancy might be interrupted.

The author believes the cause of eclampsia to be a chemical substance the product of tissue metabolism. He still adheres to the nephritic origin of eclampsia, and in one case in which convulsions and labor occurred without albumin in the urine, he does not believe that true eclampsia was present. He has, however, noted the fact that a patient may have convulsions without albumin in the urine or with a very small quantity only. He does not accept the modern hepatic pathology of this condition. In treatment, with the use of salt solution he has employed bicarbonate of potassium with chloride of sodium by hypodermoclysis, but now uses acetate of sodium and chloride of sodium in equal parts. He has found great advantage from bleeding followed by transfusion, and believes that the less interference with the uterus in eclampsia the better for the patient. In this we agree with him. He does not recognize the hemorrhagic conditions, notably in the lung, following eclampsia, which are the usual causes of the fatal issue.

In the treatment of puerperal septic infection after emptying the intestine the author advises the use of quinine and Dover's powder for pain. He considers strychnine given hypodermically the best cardiac stimulant. He does not favor curetting, but would douche the uterus with 1 to 2000 bichloride, followed by boiled water. If necessary, he would repeat intrauterine douches daily; he has not seen mercuria poisoning from this treatment. We cannot join him in his recommendation of repeated intrauterine douches nor in the use of bichloride of mercury within the womb. In pyemia he has found good results from tamponing the uterus with iodoform gauze. In sapremia after irrigating the uterus he applies iodine freely to the interior. He urges the importance of the upright or semi-upright posture in securing drainage in these cases, and describes the case of a patient suffering from severe sapremia, who persisted in leaving her bed and sitting up. The patient was better as soon as she assumed the sitting posture. He has used anti-streptococcic serum, but is not sure of its value. He reports fully a number of interesting cases of puerperal sepsis, including tetanus, in which pre-existing foci were present.

The author has performed symphyseotomy eight times with success. One of his cases was complicated, a laceration of the vagina from a fractured end of the pubes, and another patient had separation of the urethra from the vagina. This was treated by inserting a catheter, by bringing the urethra down and stitching it in its

normal position. In choosing the time for Cesarean section the author would operate as soon as the cervix is obliterated and the os will admit one finger. He does not rupture the membranes before operation. For controlling hemorrhage, he recommends a large pessary which, being pressed down upon the uterus, controls the circulation efficiently. It should be removed as soon as the uterus has been opened. His uterine stitches include the muscle and peritoneum, but he does not insert separate sutures for the peritoneum. He avoids contact with the interior of the uterus and trusts to a firm binder to keep the dressing in position. He does not use salt solution in the abdomen during the operation. Porro's operation is sometimes selected because it can be done quickly. Coeliohysterectomy is also preferred when further pregnancy is not to occur.

The author contributes two full and interesting chapters upon injuries and malformations of the newborn child. The volume concludes with a chapter upon infant feeding. Appended are the statistics of the Glasgow Maternity Hospital for three decades, a table of 41,111 cases. Among these, 137 deaths occurred, due primarily to parturition, of which 46 resulted from septicemia. At present rigid antiseptic precautions are adopted during labor and the puerperal period. Examinations are made as rarely as possible. The result has been a gratifying decrease in the number of infections.

This book should prove especially valuable to experienced men engaged in obstetric practice. Its cases are fully and clearly described and important clinical points are thoroughly brought out. It will be of less value to the student of medicine until he becomes a resident in a hospital. The style is clear and interesting, and it will prove a welcome addition to obstetric literature. Its popularity is already attested by the appearance of a second edition.

E. P. D.

A TEXT-BOOK OF PHYSIOLOGY. By WILLIAM H. HOWELL, Ph.D., M.D., LL.D., Professor of Physiology in the Johns Hopkins University, Baltimore. Philadelphia and London: W. B. Saunders & Co., 1905.

At the present time it is almost impossible in any department of science to embody in a text-book for students all the known facts, as well as the conflicting theories, concerning disputed and unsettled points. To include everything, statements must be so brief and concise that to the beginner they lose their force and meaning. The reduction in material, as the author states in his preface, "should be made by a process of elimination rather than by condensation."

This seems a very wise way out of the difficulty and a most successful one, as the book itself shows. From the author's practical experience and wide knowledge he is enabled to select certain phases of his subject which must be expanded sufficiently to make them perfectly clear, even if less important matter must be omitted. This scheme has been carried out with an excellent result. Many antiquated theories, many long and complicated hypotheses to explain unimportant points, are passed by with little more than respectful mention, while the more real and growing subjects are often discussed with some detail. But this selection and elimination is done with the utmost care, and with full knowledge of the worth of what is kept and the value of what is cast away.

In the selected subjects the material is carefully worked over; it is modern and suggestive in its treatment, so that the reader obtains a clear and definite idea of the subject as it stands today. The sections on the central nervous system, the organs of circulation, the respiration, and digestion deserve special mention.

Throughout the text there are many illustrations which assist greatly in explaining certain points. Excellent use is made of cardiographic tracings and charts of various kinds. A good feature, too, is the references to original articles inserted as foot notes on almost every page. The delightfully clear style makes reading easy and adds much to the general character of the work. The book can be very highly recommended; it is really of great value. W. T. L.

A HAND-BOOK OF PHYSIOLOGY. By AUSTIN FLINT, Professor of Physiology in the Cornell University Medical College. New York and London: The Macmillan Company, 1905.

THIS book presents the subject of physiology as taught the students of the Cornell University Medical College. In several features it is very interesting. The historical side of physiology is especially brought into prominence, and the work of Harvey, Malpighi, Haller, Du Bois-Reymond, Bernard, and such pioneers is frequently cited, especially in introducing the various subjects which these men illuminated. The anatomical facts bearing upon physiology are given a relatively large place and the illustration of the histology of the more important organs form a special feature. These illustrations are reproductions of three-color photomicrographs—a process used for the first time in this kind of work—and are collected at the end of the book as an atlas of sixteen plates. Although they are an improvement over ordinary photomicrographs as means of illustrations, they still possess much of the indefiniteness of outline and lack of character which make them rather unsatisfactory.

Gross anatomy and histology are being so well taught now that it is a question if the author has not given this side of his work too much emphasis. The book will probably prove rather ill-suited for the modern medical student, as one is struck by the author's preference for broad statements, rather than for recording briefly scientific facts. In several particulars the book does not reflect the most advanced knowledge of the day. The more recent work on the chemistry of digestion finds no place. Enzymes, or ferments, receive very meager notice, and neither word appears in the index. The author does not take sides with either the myogenic or neurogenic theory of the heart-beat, and the recent work in this part of the science receives no notice.

The style of Dr. Flint is very good and the book reads well. His experience of nearly fifty years as a teacher has enabled him to present the subject in an interesting and lucid manner, and for those who wish to study the more elementary phases of physiology, especially from the historical point of view, the book will be found pleasing and profitable.

G. C. R.

A SYSTEM OF MEDICINE BY MANY WRITERS. Edited by THOMAS CLIFFORD ALLBUTT, M.D., F.R.S., Regius Professor of Physic in the University of Cambridge, and HUMPHRY DAVY ROLLESTON, M.D., F.R.C.P., Physician to St. George's Hospital and to the Victoria Hospital for Children, London. New edition, revised throughout with additions. Vol. I. New York and London: The Macmillan Co., 1905.

OWING to the rapid strides with which the science of medicine is at present advancing the life of a modern medical book must needs be short. To ensure continuous utility, frequent revisions are necessary. Hence, it has been deemed advisable to bring out a new edition of Allbutt's *System of Medicine*. It is intended that one volume of the series shall be completed each year, thus gradually replacing the 1901 edition.

Volume I of the new series comprises Prolegomena and Fevers. In many a book the preface is no less interesting than the story itself; and as regards that of the volume under review, which is to a certain extent a preface to the whole series, the foregoing statement holds good. In it we find many subjects of great interest discussed, such as, for obvious reasons, are omitted from text-books of smaller scope. Thus an extremely interesting chapter on Anthropology and Medicine has been contributed by Beddoe, which contains much food for reflection. The chapter on the Laws of Inheritance, by Jonathan Hutchinson, is one which will equally repay perusal. The History of Medicine has been tersely and lucidly set forth by Allbutt

and Payne. Under Medical Statistics, Tatham has considered such subjects "respecting the more important diseases of the community" as are of practical utility to the general practitioner. It is to be regretted, however, that no data are given upon arteriosclerosis and heart disease.

The chapters which have undergone the most change in the process of revision are Medical Geography, by Clemow; The Hygiene of Youth, by Dukes; The Dietetics and Therapeutics of Children, by Eustace Smith. Of especial importance are the chapters on the General Pathology of Nutrition, by F. W. Mott, and the General Pathology of New Growths, by F. W. Andrewes, dealing as they do with subjects upon which much research work is being done. J. K. Mitchell has written a valuable article on Massage, a subject with which the physician is often too little acquainted from a practical point of view. Lack of space forbids the mention of many other excellent features of the work. On the whole, it may be said that Volume I is a vast storehouse of medical knowledge classified, grouped, and condensed by eminent authorities so that it shall be available for use with the least possible effort. We have no hesitancy in cordially endorsing the first volume of the revised system, and feel that its character augurs well for the volumes that are to follow.

G. W. N.

AN INTRODUCTION TO THE STUDY OF MATERIA MEDICA AND PHARMACOLOGY. BY OLIVER T. OSBORNE, A.M., M.D., Professor of Materia Medica, Therapeutics, and Clinical Medicine in Yale University. Pp. 167. Philadelphia and New York: Lea Brothers & Co.

This little book includes the elements of medical pharmacy, prescription writing, medical Latin, toxicology, and methods of local treatment. When one considers the field covered in this duodecimo volume he may expect merely a skeleton; but as he reads and studies the book he finds an amount of information, at once essential and accurate, which only the experienced and successful teacher would be able to present. After a few definitions the author proceeds at once to brief notes on experimental pharmacology and early pharmacological research, and then certain drugs for laboratory demonstration, with suggestions for recording experiments; thus suggesting to students the varieties in drug action. Pharmacy opens with definitions and some brief remarks upon the different pharmacopœias, and presents the different classes of preparations in alphabetical order. Toxicology is presented concisely and understandingly. Prescription writing calls for good form, and the results

secured should be satisfactory if the author's methods be followed, for having gone over the grammar of the prescription, its abbreviations, and weights and measures, the evolution of the prescription comes naturally. For the adaptation of remedies to the patient a classification of agents is necessary, and this is briefly and sensibly presented. The questions which arise in dosage are aptly presented and the student will be markedly enlightened by the chapters devoted to special treatments and simple food preparations. Here as well as throughout the book on every page are found many practical points and suggestions. We heartily recommend the book to the student.

R. W. W.

THE CLINICAL STUDY OF BLOOD PRESSURE. BY THEODORE C. JANEWAY, M.D., Lecturer on Medical Diagnosis, University and Bellevue Hospital Medical College. New York and London: D. Appleton & Co., 1904.

THE importance of accurate instrumental blood pressure measurements is becoming generally recognized, and observations upon the pulse tension are taking their place as routine procedures, with the data relating to the temperature, the respiration, and the pulse. There can be no doubt that if sphygmomanometry were routinely employed in practice, many a case of renal or arterial disease would be diagnosticated which is otherwise overlooked. Hypertension is very constantly present in quite a large number of these cases, whereas urinary findings may vary greatly. In fact, there seems to be an increasing tendency to lay but little importance upon a trace of albumin or a few narrow hyaline casts in the urine.

The appearance of Janeway's book, which is, so far as we know, the only work in English which covers the same ground, cannot but be of signal benefit in directing the attention of the physician to the facts of sphygmomanometry, as thus far known. The volume is divided in parts dealing with the physiological, the technical, and the clinical phases of the question respectively. The subject matter as gleaned from the literature and from the author's personal experience has been well grouped and concisely handled; and has been enhanced in value by a large number of charts and illustrations. The physiological section contains much valuable information which must be borne in mind in attempting to draw deductions from blood pressure observations. In the fourth chapter the advantages and the shortcomings of various forms of apparatus are discussed. The last part of the book deals with blood pressure as encountered in various internal diseases, nervous diseases, surgical and obstetrical conditions, etc. With a work such as this

available there can no longer be any excuse for any practitioner to remain in ignorance of the importance, the value, the technique, and the limitations of sphygmomanometry. G. W. N.

ON LEPROSY AND FISH-EATING. A STATEMENT OF FACTS AND EXPLANATIONS. By JONATHAN HUTCHINSON, F.R.S., formerly President of the Royal College of Surgeons. London: Archibald Constable & Co., Ltd., 1906.

MR. JONATHAN HUTCHINSON has long been known as an earnest and persistent advocate of the theory that leprosy is due in some, as yet unknown, manner to the consumption of badly cured or decomposed fish; and in this volume of more than four hundred pages he presents the evidence for this theory, which he has gathered from literature and from personal observation in India and Africa. With how much earnestness he pursues this subject may be inferred from the fact that, in 1901-2, at a time of life when most men would have given up serious work, he made a journey to South Africa and India for the purpose of gathering new facts, at first hand, in support of this theory.

Mr. Hutchinson believes that there is a close relationship between tuberculosis and leprosy, and that possibly these two diseases are due to the same bacillus. To quote his own words: "It is suspected that the tubercle bacillus (existing in a latent state in many persons and often hereditary) may in certain individuals become modified by some element which exists in badly cured fish, and may be made to assume the activities which result in the phenomena of leprosy." He does not believe that the malady ever arises from direct contact with the sick, and hence regards segregation as unnecessary and cruel. Besides a diet of decomposed fish which is by far the most potent cause in his opinion, he thinks it may occasionally follow the use of food contaminated by the hands of lepers and, in infants, may arise from leprosy mothers' milk.

Hansen's discovery of *Bacillus leprae* is spoken of as an unfortunate one which "threw back for a quarter of a century the investigation of leprosy. It put investigators on a wrong scent and it suggested a false conclusion," since it added strength to the doctrine of contagion.

Truly, all is fish that comes to the author's net; and many facts which other investigators regard as refuting the fish theory are claimed by him to afford support to his contentions. The well-known fact that, at the present time at least, leprosy is found chiefly in coastal and insular regions is referred to as affording strong presumptive evidence in favor of the fish origin of the disease; but its

occurrence in regions where fish are obtained with difficulty and, therefore, form an insignificant article of diet, as in Natal, presents no difficulties to the author, since, he repeatedly asserts, it is not the quantity of fish consumed that is important, but the quality, even a small quantity of decayed fish being capable of producing leprosy. Recovery is believed to occur in many cases, and relapses are not common except in those living in extreme poverty, or in those who persist in a fish diet. While many interesting and suggestive facts are presented in this book, which, like all that its distinguished author writes, is well worth reading, the evidence is not convincing.

M. B. H.

DISEASES OF THE EYE. By G. E. DE SCHWEINITZ, A.M., M.D.,
Professor of Ophthalmology in the University of Pennsylvania.
Fifth edition. Philadelphia and London: W. B. Saunders
Co., 1906.

DR. DE SCHWEINITZ'S well known work, of which seven reprints and revisions have appeared since its publication, comes up in this fifth edition to the high standard it has maintained from the beginning. The additions and amendments called for by the progress of ophthalmology serve to keep it abreast with the requirements of the time. As it now stands, it is quite the equal of any single work whose purpose is similar. It is especially commendable from its sense of proportion and sanity of treatment. The author has not been carried away by any of the fads which have been exploited from time to time for a longer or shorter period in the domain of ophthalmology.

Among the thirty-five subjects which appear for the first time we mention the *x*-ray treatment of trachoma, of which the author is not enthusiastic, though he adds that with improved technique and the ability to measure dosage of the rays, the method should be given the fullest trial. Jequiritol is properly said to be not without danger, and should be restricted to old cases of pannus with cicatrized and degenerated conjunctiva. As regards methyl alcohol amaurosis, the author does not decide whether the affection is one of the retina or of the optic nerve, but he suggests that both may be simultaneously affected. The amblyoscope for orthoptic training is commended. This fifth edition is a worthy exponent of the ophthalmology of the present day, and to it the reader can turn with confidence.

T. B. S.

URIC ACID: THE CHEMISTRY, PHYSIOLOGY, AND PATHOLOGY OF URIC ACID, AND THE PHYSIOLOGICALLY IMPORTANT PURIN BODIES, WITH A DISCUSSION OF THE METABOLISM IN GOUT. By FRANCIS H. McCrudden, M.D. The Fort Hill Press, Samuel Usher, Boston, Mass., 1905.

It is only necessary for one to glance through the book to realize the enormous amount of work required for its preparation. The entire 300 pages or more are taken up with an exposition of the results of innumerable experiments and observations upon the chemistry, physiology, and pathology of one single substance, uric acid. In attempting this, the author has collected all available data from every possible source, and the treatise is a *resume* of practically all the work that has been done upon this subject, with particular reference to recent publications. Original authorities are always quoted and a quarter, often a half, of every page is filled with references. It is, of course, impossible to review the work in detail. The pure chemistry of uric acid and the purin bodies is considered first; next, the physiology is discussed, beginning with nitrogenous metabolism in birds; and finally, the pathological aspect is reviewed, with special reference to gout. The book is primarily one of reference for the advanced student, where he may find the facts relating to almost any part of the subject, with full references to the literature. Though the results of experiment and observation are systematically presented, no attempt is made to draw conclusions. This, as is the author's design, is left for the reader.

W. T. L.

PROGRESSIVE MEDICINE. A Quarterly Digest of Advances, Discoveries, and Improvements in the Medical and Surgical Sciences. Edited by H. A. HARE, M.D., assisted by H. R. M. LANDIS, M.D. Vol. VIII, June, 1906. Philadelphia: Lea Brothers & Co., 1906.

This volume is in keeping with the excellence of those previously noticed, the most important contributions to the literature being abstracted by men qualified to judge their value. Dr. Wm. B. Coley discusses Hernia and devotes several pages to an interesting defence of the Bassini operation. Dr. E. M. Foote summarizes the literature upon the Surgery of the Abdomen. Considerable space is devoted to the drainage of the peritoneum, surgery of the stomach, the appendix, gall-bladder, etc. One is impressed by the constant reiteration of the necessity for an earlier diagnosis of diseases of the stomach and yet nothing of importance seems to have been accomplished clinically toward furthering such a desire. Gastroenterostomy still remains the operation of choice; the various

papers by the Mayos are extensively abstracted. There does not appear to be anything new in the literature upon appendicitis. The most important summary of the surgery of the pancreas which has yet appeared, that of Villar, is abstracted. Dr. J.G. Clark, discusses Gynecology, opening his article with an interesting and comprehensive review of the recent literature upon the etiology of carcinoma. The review is almost entirely confined to the various diseases and malformations of the ureter. Dr. Alfred Stengel writes seventy pages upon Diseases of the Blood, discusses diabetes, gout, hemophilia, Hodgkin's disease, and concludes with that most interesting disease, exophthalmic goitre. Dr. Edward Jackson concludes the volume, writing upon Ophthalmology. Among a number of valuable abstracts, the bacteriology of conjunctivitis, and the causes of pterygium and of sympathetic inflammation are especially interesting.

G. P. M.

WALTER REED AND YELLOW FEVER. By HOWARD A. KELLY, M.D.,
Professor of Gynecological Surgery in Johns Hopkins University,
Baltimore. Pp. 293. New York: McClure, Phillips & Co., 1906.

To his other achievements Dr. Kelly has added that of an eminently successful biographer. His account of Dr. Reed's life and work is as sympathetic as it should be inspiring to younger members of the profession yet unknown to fame. Beginning with his birth and childhood, his college days, his graduation in medicine, his entrance into the army, his marriage, his frontier life, we are led to the beginning of his scientific work at the Johns Hopkins University in 1890 to 1899, his later studies in connection with yellow fever and its propagation by the mosquito, and finally to the circumstances of his untimely death. Aside from the biography, which is replete with sympathy, appreciation, and admiration for the man and his work, Dr. Kelly furnishes an extremely interesting account of the history of yellow fever—from the earliest days, through the many epidemics and the speculative reasoning of Carlos Finlay relative to the relation of the mosquito thereto, to the final demonstration by Reed and his colleagues, Carroll, Lazear, and Agramonte, of the undoubted etiological significance of the mosquito in the spread of the infection. Of Reed, Dr. Kelly says: "Though a man of war, he ravaged no distant lands, he destroyed no tens of thousands to make his reputation, but by quiet methods, when there was no strife, he saved countless lives and swept away a hideous plague, which from time immemorial has periodically visited our shores, devastated our fair land, and too often snatched from the years of peace and plenty all their blessings." Such are the plaudits of the populace that his work is valued least by those

whom it has helped most; but he doubtless found his reward when he wrote to his wife: "The prayer that has been mine for twenty years, that I might be permitted in some way, or at some time, to do something to alleviate human suffering, has been granted." The book as an admirable biography, a pleasing and interesting narrative, and a record of magnificent achievement, forms a notable addition to contemporaneous literature. A. K.

THE PROCEEDINGS OF THE CHARAKA CLUB. Volume II. Pp. 152.
New York: William Wood & Co., 1906.

THE Charaka Club, named for the Hindu sage, is a small and rather unique organization of medical men interested in the literary, artistic, and historical aspects of medicine. Volume II of their proceedings consists of an interesting collections of poems, essays, reminiscences, and a story, of which the following are of more than ephemeral value: Books and the Man, by S. Weir Mitchell; Fracas-torius, by William Osler; Charaka and His Times, by Smith Ely Jelliffe; Self-mutilation of the Eyes by an Ancient Saint and a Modern Sinner, by Ward A. Holden; The Medicine of Horace, by Charles L. Dana; and the Diseases of Learned Men, by Walter B. James. A. K.

INFECTION, IMMUNITY, AND SERUM THERAPY. By H. T. RICKETTS, M.D., Instructor in Pathology in the University of Chicago. Pp. 600. Chicago: American Medical Association Press, 1906.

THIS volume consists of the reissue in book form of a series of articles originally published in the *Journal of the American Medical Association*. It is divided into two parts, of which the first comprises a discussion of infection, immunity, toxins, antitoxins, and serum therapy, as well as the related subjects of agglutination, precipitation, phagocytosis, hemolysis, etc.; and the second part, of a more or less detailed discussion of the different infections that affect man and the lower animals. The book is a good and judicious summary of existing knowledge of the subjects of which it treats, and forms a valuable addition to medical literature. A. K.

PROGRESS OF MEDICAL SCIENCE.

MEDICINE.

UNDER THE CHARGE OF

WILLIAM OSLER, M.D.,

REGIUS PROFESSOR OF MEDICINE, OXFORD UNIVERSITY, ENGLAND,

AND

W. S. THAYER, M.D.,

PROFESSOR OF CLINICAL MEDICINE, JOHNS HOPKINS UNIVERSITY, BALTIMORE, MARYLAND.

Gallop Rhythm of the Heart.—FRIEDREICH MÜLLER (*Münch. med. Woch.*, 1906, liii, 785). Gallop rhythm of the heart consists in the interposition of a third sound in the cardiac cycle. This sound occurs in diastole and is associated with a definite shock which is visible and easily palpable and makes a marked impression on the cardiographic record. In the cardiogram this impression may appear immediately before the systolic rise—the presystolic type, or in the first half of diastole, shortly after the second sound—the proto-diastolic type. Both of these waves are visible in the record of a normal apex-beat, although they are then very small elevations. They are pictured and studied by Marey in his classical work on the circulation and are particularly well illustrated in the tracings of Edgrem. It has been noted, too, that in cases of acute pericarditis in which there is certainly no change in the heart muscle, that the friction rub has a triple rhythm entirely analogous to the gallop rhythm. The occurrence of the first or proto-diastolic wave corresponds with the period of greatest relaxation of the ventricular muscle and is synchronous with the negative wave or drop in the jugular pulse tracing; it marks the time when the blood begins to flow from the auricle into the ventricle. The presystolic elevation comes immediately before the ventricular contraction, is synchronous with an elevation in the jugular tracing, and is due according to Marey, not to the auricular contraction, but to the increased velocity of the blood flow from this contraction.

The numerous curves which Müller presents show the justice of Potain's division of gallop rhythm into the presystolic and the proto-

diastolic type. In some curves the third sound occurs just before the systole and is marked on the cardiogram by an accentuation of the normal pre-systolic elevation, and occurs synchronously with a rise in the jugular pulse. The occurrence of this presystolic sound might be due to an unusually large amount of blood being thrown into the ventricle or to a loss of tone and elasticity in the ventricular wall. Potain assumes that a relaxed or sclerosed ventricular wall lends itself more easily to dilatation and oscillation (*erschütterung*) than a normal one, and he gives his support to the second view. Although such a notion is purely hypothetical it draws some support from the observation that dilatation is nearly always present when there is gallop rhythm. Chauveau, who favors the other view, insists that since gallop rhythm is so frequently a transient feature its occurrence cannot depend upon a permanent change in the ventricular wall. That the presystolic sound, on the other hand, is due to an exaggerated activity of the auricle, is suggested by the frequent finding postmortem of dilatation of the auricle and a considerable hypertrophy of its wall. Such a finding, however, is not constant. Frank has shown that the pressure increase caused by the auricular contraction when the auricle is better filled and more distended is plainly shown in the ventricular curve, and Marey, too, points out that the presystolic wave in the cardiogram is more marked when the auricle discharges its blood into a ventricle already filled, or in other words, a ventricle incompletely emptied. The evidence indicates that the presystolic gallop rhythm depends upon an increased discharge of blood from the auricle into the ventricle. It is interesting to note that, as a rule, in presystolic gallop rhythm the presystolic wave is further away from the ventricular systole than normal—that is, the time between the auricular and the ventricular contraction is increased. This might be explained upon the characteristics of the heart muscle as brought out by Englemann, namely, the retarded conductivity in dying muscle or in damage to the auriculoventricular bundle. Or one might think that when the ventricle empties itself only incompletely a greater tension is required in the auricle to overcome the resistance of an already filled ventricle and that the auricular contraction is thus prolonged, just as the ventricular systole is prolonged in the face of increased arterial tension.

Müller also shows curves of typical proto-diastolic gallop rhythm in which the elevation occurs early in diastole and is synchronous with a venous negative pulse. In many of these tracings the presystolic elevation is likewise well-marked, and the close relation between the two types is further indicated by the ease with which one passes into the other. It is frequently noted that as conditions grow worse an existing presystolic gallop rhythm will change to a proto-diastolic. Barié insists that the latter is the more serious form and that it is always associated with dilatation of the ventricle. The time in the cardiac cycle at which the proto-diastolic sound occurs, the fact that the two waves appear so frequently in the same curve, and that the two sounds so repeatedly change from one to the other, lead one to assume a similar cause for both, namely, an increased flow of blood from the overdistended auricle into the ventricle. As a general rule, the presystolic type occurs with a slow, forcible heart action, the proto-diastolic when the heart action is more seriously disturbed, as evidenced by rapidity and irregularity and signs of circulatory stasis.

Another feature in Müller's curves is the relative length of systole as compared with diastole. This lengthening of systole is apparently due to a delayed relaxation of the ventricular wall which requires a more rapid outflow of the auricular blood when relaxation is complete. As Barie has observed, gallop rhythm occurs principally in conditions in which the blood pressure is high, but the fact that it occurs, too, in infectious diseases in which the pressure is low and in which there may be evidence of disease of the heart muscle, and that in cases of nephritis and arteriosclerosis and myocarditis it is not infrequently present at a time when the pressure is low, indicates that high tension is not the all-important factor that Barie considers it. The condition depends more probably upon the disturbance of the adjustment between the heart's strength and the resistance to be overcome. Gallop rhythm is found almost always associated with evident signs of cardiac insufficiency, no matter whether this insufficiency be due to an increase in peripheral resistance or decrease of cardiac power. As the circulatory conditions become readjusted the gallop rhythm tends to disappear. That the ventricle is in some instances struggling against a resistance which it can overcome only with great difficulty is indicated in some curves by a definite prolongation of the time of closure or the time between the beginning of the ventricular contraction and the opening of the semilunar valves.

Besides the increased resistance and the lessened cardiac power the rapidity of the heart-rate is also of importance in causing gallop rhythm. Schiff was able to produce gallop rhythm in dogs by cutting the vagus. In Basedow's disease and in tumultuous heart action from any cause the same tendency to gallop rhythm is noticed. In these cases it is due probably to the very short duration of diastole. The systoles crowding in one upon another, the auriculoventricular bundle has not time to recover its conductivity, and the distance between the auricular and the ventricular beats becomes so great that it may almost seem that the auricle is beating after the ventricle.

The prognosis of gallop rhythm is not always bad. Many patients live comfortably for years after its onset. Its occurrence, however, should always demand our earnest attention, and it is frequently an indication for active therapeutic measures, particularly for the administration of digitalis.

Gout and its Causation.—HALL (*The Practitioner*, 1906, lxxvi, 361) discusses the causation and treatment of gout and reviews the recent literature on the subject. His own work on the metabolism of gout is so well known and trustworthy that the following paragraph may be appropriately quoted:

"Uric acid cannot be regarded as a distinct factor in the causation of disease. We have still much to learn concerning its circulation in the tissues, and its capabilities for combinations therein. We need also further information as to its manner of excretion from the human body, and its varying behavior in individuals presenting different metabolic powers. Under properly arranged conditions, the rate and extent of its excretion may be utilized for the interpretation of the personal tolerance for exogenous nucleins, and for the elucidation of some of the intermediary stages in metabolism; but as an etiological entity, uric acid must be definitely discarded. It is high time that every practitioner made a point of fully educating the public in this subject."

The bacterial origin of gout is discussed. Trautner regards *Bacillus coli communis* as the cause of the disease. Others have supported the bacterial theory. Regarding the subject Hall says: "We cannot yet suppose a specific organism for gout, and the general metabolism plays a greater part in regard to the action of accidental or exceptional intestinal toxins than is generally acknowledged. At the same time, it must be conceded that hereditary deficiencies in digestive faculties, or idiosyncrasies of metabolic functions, may permit the formation of exceptional toxins, or decrease the resistance to products of the ordinary intestinal bacteria."

Much work has been done on the relationship of glycochol to the etiology of gout. Hall, himself, finds it present in the urine in 70 per cent. of the cases, but states that there is no present proof that it is a causative factor. Shearer has suggested that an excessive quantity of carbonic acid in the arterial blood is a condition that leads to gout, and states that exercise, consequently, has a beneficial effect upon those subject to the disease because it increases the exhalation of carbonic acid.

Hall claims that hepatic insufficiency accounts for many of the symptoms of gout. Hepatic stimulants give the best results. He does not state what ones he uses. The accurate adjustment of food to the capacities of the intestinal mucosa and the liver is one of the best forms of treatment. The purins in the food and the purins in the urine are taken as the indicators.

Bacteriology of a "Common Cold."—BENHAM (*Brit. Med. Jour.*, 1906, ii, 1023) made a bacteriological study of the nasal secretions in twenty-one cases of mild "common cold" occurring in the vicinity of Brighton, England. There was no influenza epidemic prevailing. The clinical symptoms were usually sore throat, sneezing, malaise, headache, more or less nasal discharge, and slight fever. Most of the patients were able to go about. The previous work done on the bacteriology of the nasal discharge in normal persons and in persons with colds is reviewed. Of the 21 cases diphtheroid organisms were found in 20 (95 per cent.) of the cases. In 5 these bacilli were isolated in pure culture. Cocci negative to Gram's stain were found in 10 cases (48 per cent.) and isolated in pure culture in 2. Other cocci positive to Gram's stain were seen in 14 cases (67 per cent.). Some were undoubtedly pneumococci, but they were few in all cases and not isolated in any of them. Pfeiffer's influenza bacillus was found in only 2 instances, but was not isolated in pure culture.

It will be seen that a diphtheroid organism was almost a constant accompaniment of the colds. The cultural and biochemical characteristics of the organism are described in detail. Microscopically it is a short bacillus which tapers to rounded ends. In early cultures it is so short as to resemble an oval coccus. The average length in a three-day-culture is 1.5 microns and the breadth 0.3 to 0.4 micron. By the third day a characteristic appearance develops. The protoplasm at the ends of the bacillus is deeply stained, leaving an unstained band or septum across the middle of the bacillus. With a good illumination the outline of the bacillus can be clearly seen, especially in specimens counterstained with carbol-fuchsin. Benham thinks the organism has frequently been mistaken by previous observers for a diplococcus or

diplobacillus. Cultural and microscopic characteristics are cited that distinguish the organism from the true diphtheria bacillus.

The pathogenicity of the organism in animals was not definitely determined. Benham has suggested the tentative name of *Bacillus septus* for the bacillus. He thinks that it is probably identical with the organism isolated by Cantley and called *Bacillus coryzae segmentosus*. He believes that the organism is responsible more for the sore throat, headache, malaise, and muscular pains than for the coryza. The coryza, when present, was probably due to the micrococci found and these he stated had the characteristics of the *Micrococcus catarrhalis* of Pfeiffer. The investigation favors the view that "common colds" are in all probability due to bacterial infection.

Xanthoma Tuberosum Diabeticorum. ABRAHAMS (*The Post-Graduate*, 1906, xxi, 533) reports an instance of this form of xanthoma of eight years standing in a male diabetic, fifty years of age. It began as a small, painful nodule at the nape of the neck near the border of the hair. After the patient first picked it off with the finger nail, it returned and steadily grew. One year after its appearance diabetic symptoms became marked. The mass gradually grew until it reached an inch by an inch and a half in size. It was made up of a series of nodules or tubercles of hazel-nut size—round, smooth, and lobulated. The upper border of the growth was red, the lower border pale.

The patient eventually began to experience difficulty in swallowing. He was unable to swallow any solid food whatever. The passage of a bougie revealed a stricture of the œsophagus near the cardiac orifice of the stomach. Two well-known clinicians, overlooking the xanthoma on the neck, made a diagnosis of carcinoma of the œsophagus. With proper diet and medicines the patient became aglycosuric, the tumor steadily diminished in size, and the dysphagia gradually disappeared, so that he could eat chopped meat, potatoes, and crackers. Xanthomata are well known to attack the œsophagus, heart, and other internal organs in diabetes, and Abrahams thinks that there is little doubt that the stricture of the œsophagus in this case was due to a local xanthomatous tumor. It is well known that xanthomata in diabetes disappear with the disappearance of the sugar in the urine, to return again with the reappearance of glycosuria.

On the Presence of Kernig's Sign in Zona.—BELBEZE (*Archives Générales de Médecine*, 1906, lxxxiii, 520) states that in the last four years he has observed nineteen cases of herpes zoster or zona, and has examined each case for the presence or absence of Kernig's sign. In only two instances was it present. Both cases were in women, one sixty and the other sixty-five years of age. In both instances also the eruption was along the course of one or more branches of the lumbar nerves.

Complications of Acute Pneumonia.—HENRY JACKSON (*Boston Med. and Surg. Jour.*, May 31, 1906, p. 620) has analyzed the various complications occurring among 1320 cases of acute lobar pneumonia treated at the Boston City Hospital. The complications directly connected with the lung were as follows: Empyema, 22 cases; lung abscess, 4 cases; lung gangrene, 3 cases; pleurisy with large effusion, 23 cases; unresolved pneumonia, 5 cases.

The complications not directly connected with the lung were: Pericarditis, 22 cases; phlebitis, 6 cases; meningitis, 3 cases; joint disease, 1 case; neuritis, 2 cases.

These complications probably fall considerably short of the actual total, for they include only the clinical diagnosis, the autopsy records not having been included in the analysis.

SURGERY.

UNDER THE CHARGE OF

J. WILLIAM WHITE, M.D.,

JOHN RHEA BARTON PROFESSOR OF SURGERY IN THE UNIVERSITY OF PENNSYLVANIA;
SURGEON TO THE UNIVERSITY HOSPITAL,

AND

T. TURNER THOMAS, M.D.,

ASSISTANT SURGEON TO THE UNIVERSITY AND PHILADELPHIA HOSPITALS, AND ASSISTANT
INSTRUCTOR IN SURGERY IN THE UNIVERSITY OF PENNSYLVANIA.

Simple Fractures of the Upper End of the Radius.—PRAT (*Revue d'Orthopedie*, March 1, 1906) says that it is astonishing how fracture of the upper end of the radius has passed without recognition, and how rare and brief are the descriptions of it in the books. He refers to about twenty cases from the literature, and reports four new cases. His conclusions concerning this fracture are based upon a study of the literature and his own cases.

The etiology, he says, requires no special mention. The usual cause is a fall on the hand, the force being received by the thenar side of the palm. Exceptionally the fracture may be due to direct violence, especially when applied to the posterior surface of the head, which is superficial. Quoting Tixier, he says that very rarely fracture of the neck may be due to violent contraction of the biceps muscle, the head being resisted by the annular ligament above. In the absence of any ligamentous attachment to the head or neck of the radius, fracture by the tearing of a ligament cannot occur.

Most frequently the head or neck is broken by a bending or crushing effect, the radius being caught between the humerus and the ground. The head does not continue the axis of the shaft, but forms an angle with it opening externally, so that a bending effect is produced in a fall on the hand. When this flexion does not occur the head receives the whole force and is crushed by the humeral condyle. The results of experimental fractures here, as in other parts of the body, are not convincing.

These fractures are divided into those which are complicated by other lesions of the elbow, and those which are uncomplicated. Fractures of the head are usually due to a crushing force, the lines of fracture being vertical or oblique. They are always intra-articular, making possible all the sequels consecutive to hemarthrosis. When a fragment of the head is rendered movable, it may become an intra-articular foreign body.

Fractures of the neck, when not due to an extension of a fracture of the head, are transverse or oblique. Prat believes that these are the cases due to a bending of the head downward. The horizontal line of fracture may be incomplete in some cases, that is, it may involve only a part of the thickness of the bone; in others, it may be complete and cause a decapitation. As a general rule the upper fragment is displaced backward and outward so as to lose contact with the inferior fragment, which is pulled upward and forward by the pull of the biceps. Sometimes there is a corresponding injury of the humeral condyle.

The symptoms will vary according to the type of fracture. In a simple fissured fracture the diagnosis will be confused with that of a sprain or contusion. The most characteristic sign will be the fixed and limited pain over the radial head, which rotates normally under the finger. In fracture of the neck with displacement, the symptomatology is more striking. When the fracture is complicated by neighboring fractures or dislocations, it may pass unrecognized. The skiagram, alone, can be positive in all cases. In fractures of the neck crepitus can be completely absent when the fragments are no longer in contact with each other, but the characteristic displacement will be present. This type may be confused with a luxation of the radius, the most characteristic differential sign being the rotation of the radial head in luxation, and its absence in fracture.

In simple fissured fractures without displacement, the prognosis is good for a full and rapid re-establishment of function, although the reactionary thickening may lead to future limitation of motion. The prognosis is grave in the fractures with displacement abandoned to a spontaneous cure. Consolidation of the fragments occurs in a vicious position. They may unite with the coronoid process, produce exuberant osteophytes, lead to false union, or to foreign bodies in the joint.

Prat says that a simple fissured fracture should not be immobilized. When there is a displacement of the upper fragment, its reduction is frequently impossible and when accomplished it is maintained with difficulty, so that there is only one recourse, excision of the head. This should not be done until the acute symptoms following the fracture have subsided, since the parts are then too sensitive to infection. The functional results were good in one case operated on, and in a second the patient was not seen after the twelfth day, when he was discharged with the wound cicatrized. Skiagrams later showed that some regeneration of the head had occurred in the first case.

Thomas (*Univ. Penna. Med. Bull.*, September-October, 1905) published a paper on this subject, in which he reported forty-eight cases from the literature, five new cases, and fifty-five from skiagraphic collections in Philadelphia, his own cases, however, being included in the latter. He produced on the cadaver, in five specimens, what he believes to be the typical vertical fracture of the radial head, by the same kind of force which is probably responsible for it in life, failing only in one attempt, and in that the occurrence of a fracture of the lower end of the radius was responsible for the failure.

His conclusions as to the mechanism, symptomatology, diagnosis and prognosis agree, in the main, with those of Prat. The latter, however, while calling attention to the remarkable frequency with which the fracture has passed unrecognized, throws no light on the

actual frequency of the fracture. Thomas has produced statistics which tend to show that it is as frequent as fractures of the patella. The axis of the head and neck can hardly be said to be at an angle with each other, as Prat says, since the upper cup-shaped surface of the head is at right angles with the axis of the shaft. One portion of the circumference of the head, however, is more prominent than the rest, and it is that portion which usually receives the brunt of the force in a fall on the hand, since it is anterior in pronation, and in extension of the elbow the humeral condyle is in contact only with the anterior portion of the radial cup. Prat has not recognized this fact, which was pointed out by v. Bruns, in 1881. It is just this portion of the head which is broken off in the usual vertical fracture of the head, and driven toward the palm in transverse fractures of the neck, according to Thomas' investigations.

The most confusing feature associated with this fracture is the change in position of the fragment or fragments by rotation of the forearm, the head normally rotating to the extent of about 180 degrees. When Prat says that, as a general rule, the displacement of the upper fragment is posteriorly and externally, without describing the position of the forearm, the statement has little meaning.

Those cases in which the absence of crepitus is due to so great a pull of the biceps on the lower fragment that the fractured surfaces are no longer in contact, are probably much more rare than Prat states. Some impaction is probably associated with the bending of which he speaks, in many cases, as it is in fracture at the lower end of this bone, and from the same cause. In two of Thomas' cases it was evidently present, and in Mütter's probably so. It would account for the difficulty in reducing the deformity and for the absence of crepitus. In view of the excellent results which followed non-operative treatment in one of Thomas' cases, and practically no treatment at all in the other, this being examined long after it was well, the statement that fractures of the neck with displacement of the upper fragment, which is probably always present, indicates an excision of this fragment in every case, can hardly be considered good surgery. Such a rule would very likely lead to many unnecessary infections of the elbow-joint.

Prat has very little to say of the vertical fractures of the head, which are probably much more frequent than the transverse fractures of the neck. His statement that the skiagram is always to be relied on for the diagnosis of these fractures, will not hold true in this type. Thomas reported one case in which a lateral view showed the fracture distinctly, while the anteroposterior gave no sign of it, although both skiagrams were equally clear. The frequent close approximation of the fragments by the orbicular ligament, the difficulty in determining the line of fracture, and the frequency of obscure shadows, present difficulties that are not to be overcome without great care.—J. W. W.

The Technique of Gastrojejunostomy.—MAYO (*Annals of Surgery*, April, 1906) states that the results of this operation depend more upon the condition of the patient when operated on than on the technical difficulties of the operation. The serious cases of acute "vicious circle" occurring during the first week, have practically disappeared with the evolution of better methods. The most common subsequent complication is the chronic regurgitation of bile, which comes on at

intervals in a small percentage of cases. Since January 1, 1905, all "loop operations," with or without enteroanastomosis or closure of the pylorus, have been discarded, the gastric anastomosis being made as close to the origin of the jejunum as possible. Of fifty-six cases operated on in this way, two developed chronic biliary regurgitation of a serious character. Re-operation in both showed that the cause was an angulation of the jejunum at its gastric attachment, due to partial twisting as a result of suturing in the line of peristalsis. Since July 1, 1905, the reversing of the jejunum has been abandoned, and in a larger number of cases, sixty-five, not a single case gave trouble and no death has occurred. The jejunum is applied to the posterior wall of the stomach from right to left exactly as the intestine lies in the abdomen. The idea of reversing the peristalsis is not original with Mayo.

Traumatic Defects of the Skull; Their Relation to Epilepsy; A Clinical and Experimental Study of Their Repair.—ALLEN, SANFORD, and DOLLEY (*Boston Medical and Surgical Journal*, April 12, 1906) report seven cases in which traumatic defects in the skull were repaired by the implantation of grafts taken from another part of the skull, that consisted of an equal-sized area of pericranium and attached external layer of the skull. In the removal the bone necessarily was broken into small fragments. Any connective tissue covering the exposed portion of the brain is carefully removed. Since the scar tissue and dura are often inseparable the pia covering the brain may be thus exposed. The graft is carefully laid in position and covered with the scalp, a cigarette drain being employed for a few days. Healing by first intention occurred in every case, and the defect was repaired by what appeared to be bony structure. A macroscopic and microscopic study was made in a series of successful experimental grafts made on dogs.

Non-lithogenous Obstruction of the Biliary Ducts.—CORDIER (*Surgery, Gynecology, and Obstetrics*, April, 1906) reports one case in which the obstruction was due to an indurated mass just where the common duct passed behind the duodenum. This was the site where a large stone had ulcerated into the duodenum, and in healing had formed a complete stricture of the duct. The gall-bladder held four pints of bile and mucus, but no stone was found after a careful search of the ducts. An anastomosis was made between the gall-bladder and jejunum. The symptoms later disappeared entirely and three years after operation the patient was entirely well.

Strictures of the cystic duct are more likely to form than in the common duct. The surrounding structures are more dense and unyielding; there is no constant flow of bile to wash away infection from the intestine, or any sedimentary nucleus; and when once formed an obstruction tends to become complete. In such a case, cholecystostomy with drainage may be sufficient for treatment. With the subsidence of the acute symptoms, the canal becomes pervious, and bile begins to flow freely from the established fistula, when the end has been attained. It is better, however, when the gall-bladder is full of strictures to remove it, as in the case of the appendix. In the chronic cases, when the gall-bladder is a mass of scar tissue, a cholecystectomy should be done.

In a second case, a man, aged twenty-one years, had had attacks

of "colic" since he was three years old. At operation, just where the common duct passed under the first part of the duodenum, the duct was as hard as a tendon, and appeared to be in very much the same pathological condition that is found in appendicitis obliterans (choledangitis obliterans). Cholecystojejunostomy was again performed with a Murphy button. Satisfactory cure resulted, which Cordier is afraid will not be permanent, owing to the change produced in the liver and spleen by the long-continued (eighteen years) obstruction. In a third case a similar condition resulted in the common duct, from the kick of a horse, and was cured by a similar operation. In a fourth case the cause was a chronic pancreatitis involving the ductal opening into the duodenum. One year after the performance of the operation the symptoms had not recurred. Cancerous invasion here is frequently due to the existence for a long time previously of some benign condition. Cancer of the bile passages occurs most frequently in the lower portion of the common duct, the location of most lithogenous obstructions.

Treatment of Varicose Veins.—MAYO (*Surgery, Gynecology, and Obstetrics*, April, 1906) thinks that the most common etiological condition is the existence of a congenital defect in the vein walls or valves, or in the innervation. There is a considerable question whether normal veins give way under the ordinary strain of life.

One hundred and eight-five operations have been done for varicose veins, many upon both limbs. The complete Schede operation has not been performed for several years; but a partial Schede, or oval or interrupted incision above or about a large ulcer, is frequently done, and combined with excision of the ulcer and skin grafting. The Trendelenburg operation is also done. Mayo has been partial to the excision of the long saphenous vein in the majority of cases. This is done by long incisions, leaving five or six inches of skin intact at the thigh, a pair of forceps being employed to enucleate and loosen the vein in the uncured area.

More recently he has employed a ring vein enucleator, which consists of a quarter-inch ring of steel with a long handle, the whole instrument being not unlike a blunt uterine curette bent to an angle near its tip. He has also had made for the same purpose a pair of long forceps, which form a ring at the end when closed. Beginning the operation above, the vein is exposed, ligated, and cut. The lower end of the vein is passed through the ring of the enucleator or the forceps. In this way by a gentle pushing force the vein is stripped from the surrounding tissues and the lateral branches torn off for six or eight inches, when a small incision is made in the skin and the isolated vein pushed through. The process is repeated downward in a similar manner.

Calculus deposits, sacculations, or extreme weakness of the vessel walls, render the case unsuited for this method, and this occurs in about 10 per cent. of the cases. Hemorrhage is prevented by elevation of the leg on an ordinary gynecological standard. This renders the limb partially bloodless and secures accessibility of the field of operation. More than ordinary hemorrhage from torn branches can be checked by pressure with a pad.

THERAPEUTICS.

UNDER THE CHARGE OF

REYNOLD WEBB WILCOX, M.D., LL.D.,

PROFESSOR OF MEDICINE AND THERAPEUTICS IN THE NEW YORK POST-GRADUATE MEDICAL SCHOOL AND HOSPITAL; VISITING PHYSICIAN TO ST. MARK'S HOSPITAL,

ASSISTED BY

HENRY HUBBARD PELTON, A.M., M.D.,

INSTRUCTOR IN MEDICINE IN THE NEW YORK POST-GRADUATE MEDICAL SCHOOL AND HOSPITAL;
CHIEF OF THE MEDICAL CLINIC, PRESBYTERIAN HOSPITAL DISPENSARY, NEW YORK.

Sodium Citrate in Infantile Vomiting.—M. VARIOT considers that sodium citrate is a very potent remedy in the treatment of the digestive disorders of infancy. Its employment is based upon the fact that when taken into the stomach it reduces the tendency of the milk to clot in this organ, and in consequence, increases its digestibility. Diarrhœal conditions and vomiting are especially amenable to treatment by sodium citrate. The author prescribes a solution of the salt in water, 5 parts to 300, of which he gives 1 to 2 drams before each feeding. The theory that the sodium citrate increases the normal citric acid of the milk is false; indeed, sterilization of the milk destroys the normal acid, and it is on account of the absence of this ingredient in sterilized milk, according to certain observers, that scurvy occurs in infants thus fed. Consequently, if this hypothesis be true, sodium citrate may be an efficient antiscorbutic.—*La Quinzaine Therapeutique*, 1906, No. 23, p. 536.

The Treatment of Mucous Colitis.—DR. R. SAINT-PHILIPPE reports excellent results from the following treatment: 1 to 5 minims of aconite tincture and 5 to 30 minims of syrup of ipecac (the dose being regulated in accordance with the age of the patient), mixed with a neutral vehicle, are given every two hours, day and night. If fever is absent the aconite should be omitted. The patient should be kept continually under the influence of the medication and no apprehension need be felt if constipation is induced. When improvement without complete recovery is noted, the author advises the substitution for the ipecac of a cold maceration of freshly powdered guarana, the dose of which is 7 to 15 grains in sweetened water during the twenty-four hours. Guarana is a sovereign remedy in dysentery after the acute stage is over and the fever has disappeared. The cause of the disease should, if ascertainable, be suppressed, fats should be interdicted, the drinking water should be of the purest, and fruits should be taken with care.—*Revue Française de Médecine et de Chirurgie*, 1906, No. 2, p. 27.

The Dietetics of Gastric Ulcer.—DR. SENATOR advises a diet feeble in nitrogenous elements, but which contains gelatin (the latter being both a hemostatic and a food), fat, and sugar. The consistence of this diet is fluid, it is sufficiently nourishing, and is non-irritant. It is prepared by dissolving 4 to 6 drams of pure white gelatin in about 6 ounces

of water to which have been added about 7 drams of citron oleosaccharide. This quantity is taken in twenty-four hours, together with 8 ounces of cream and 1 ounce of butter. The daily ration represents about 900 to 1000 calories. The gelatin may be replaced by analogous substances, such as calf's foot jelly or fish gelatin, and for the butter one may substitute olive oil, milk of almonds, etc., according to the tastes of the patient. To some patients it may be necessary after a week of this diet to give finely minced raw meat, others can bear the gelatinous diet for a longer period.—*La Semaine médicale*, 1906, No. 3, p. 33.

The Renaissance in Therapeutics.—Dr. R. C. CABOT summarizes a paper as follows: 1. Therapeutics has become, within the past few years, very noticeably more effective. 2. This increased effectiveness is the result of (a) the aggressive spirit as exemplified by the New York Board of Health in the School of Hygiene and Inspection, and by the tuberculosis work now being carried on in Boston; (b) the greater part now being taken by the laity in medicinal work, both by intelligent co-operation and by financial support; (c) our greater acquaintance with physical therapeutics, especially with the details upon which their successful application depends; (d) the rise of scientific mind cure and of social work, marking a recognition of the psychical and of the social elements in all diseases; (e) a wider utilization of the unique talents of women in the field of therapeutics. 3. With the rise of the type of therapeutics here described we are now witnessing a limitation of the sphere of surgical therapeutics and of drug therapeutics. The latter limitation will do much to undermine the superstitions on which the "patent medicine" habit rests.—*Journal of the American Medical Association*, 1906, No. 22, p. 1660. (It is gratifying that the therapeutic awakening which took place many years ago and in which the American Therapeutic Society had a prominent part is beginning to be recognized in some quarters. The broader concept of therapeutics will doubtless lead to still greater achievements in the healing art.—R. W. W.)

Cocillana as an Expectorant in Pulmonary Tuberculosis.—Dr. GEORGE W. NORRIS has employed this drug in thirty-one tuberculous patients in which an expectorant was indicated. The preparation used was a fluidextract of the bark of *Syncocarpus rusbyi*, a large tree found in Bolivia. The physiological action of the drug is said to resemble that of ipecacuanha, but as an expectorant it is supposed to possess a more stimulant effect than the latter, and also to act as a mild laxative and cardiac tonic. The author obtained the most satisfactory results from 5 drop doses given in water at three-hour intervals. Of the patients who received the drug, six were in the early, twelve in the second, and thirteen in the advanced stage of the disease. The results were as follows: Marked improvement, seven; slight improvement, fourteen; no improvement, eight; apparently worse, two. Improvement when it occurred was commonly manifested by a lessening of the viscosity of the sputum and a corresponding increase in the ease of expectoration. Cough as a symptom was little affected. The quantity of the sputum was little modified; there was no apparent effect upon the pulse rate or heart action. In four instances the response to the physiological action of the drug was prompt and brilliant, but in the majority the results were not very striking. No means were ascertained by which

one could judge beforehand which patient would respond best to treatment. In conclusion, the author states that the results achieved were not as satisfactory as those obtained from an expectorant mixture containing ammonium chloride, glyceryl nitrate, aromatic spirit of ammonia, nux vomica, and elixir of calisaya.—*The Therapeutic Gazette*, 1906, No. 6, p. 370.

Physical Agents in Acute Articular Rheumatism.—DR. A. LAQUEUR deprecates the present tendency to neglect local applications in acute rheumatism and to depend wholly upon the salicylates. In connection with the latter he employs compresses lightly wrung out in cold water; these are wrapped about the inflamed joints and are kept moist by allowing water to drip upon them from time to time; by this means, the local inflammation is effectually relieved. In case of complicating endocarditis cold is applied to the precordium thrice daily for an hour at a time. When the temperature has fallen to normal the salicylates are stopped and full baths at 95° to 100.4° F., lasting from ten to twenty minutes, are given; if endocarditis is present the bath should not exceed 98.6° F. nor last more than fifteen minutes; following the bath cold is applied to the precordial area. Local treatment in the form of hot air, passive congestion according to Bier's method, centripetal massage, etc., is prescribed. If the acuity of the inflammation resists the salicylates, hot baths, followed by sweating induced by wrapping the patient in hot, dry sheets, are indicated; if the pains are obstinate ichthyol is added to the bath.—*Berliner klinische Wochenschrift*, 1906, No. 11, p. 329.

Sodium Citrate in Infant Feeding.—DR. W. H. WYNN emphasizes the advantages accruing from the addition of sodium citrate to the artificial foods of infants thus: The common cause of milk-dyspepsia is the density of the clot formed in the stomach; sodium citrate increases the digestibility of milk by lessening the amount of clot, consequently by its use, milk can be given in more concentrated form and overdilution prevented. There is no danger of rickets or scurvy. The chief indications are (1) for correcting milk-dyspepsia; (2) for weaning a healthy infant to cows' milk. The amount to be added to each feeding for a child of one month is 1 grain dissolved in a dram of water. The sodium citrate may be increased or diminished with the age, progress, and weight of the infant. The author considers the salt also useful in adults when plain milk is not well borne, as in gastric ulcer, gastritis, pneumonia, enteric fever, etc. It is useless in the severe gastroenteritis of infancy, fat dyspepsia, with impure or adulterated milk, and in primary infantile atrophy.—*The Birmingham Medical Review*, 1906, No. 39, p. 123.

The Serum Treatment of Enteric Fever.—M. JOSIAS has employed Chantemesse's serum in the treatment of enteric fever in children, for the past four years. Previously he had used cold baths, with a mortality of from 10 to 12 per cent. The death-rate under treatment with serum injections and bathing has fallen to 3.8 per cent. in nearly two hundred instances of the disease. Of the five deaths which took place perforation was responsible once, meningitis once, pneumonia once, laryngitis with otitis and pulmonary congestion once, and intestinal hemorrhage once. Of complications in the patients who recovered, hemorrhage

occurred five times, otitis three times, phlebitis twice, nephritis once, and periostitis once. Relapses were few and mild. From his results Josias concludes that Chantemesse's antityphoid serum is harmless and that patients treated by it, in connection with baths, stand a better chance of recovery than those treated by hydrotherapy alone.—*Bulletin de l'Académie de Médecine*, 1906, No. 10, p. 301.

Radiotherapy and Diphtheria Antitoxin in Pernicious Anemia.—M. REXON reports a case of pernicious anemia in which marked cachexia, œdema, and diarrhœa were present, and in which the blood, when the patient was first seen, contained 880,000 red cells and 2000 leukocytes. Under arsenic the condition was aggravated rather than improved, but the application of the Röntgen rays rapidly caused an increase in the red corpuscles to 920,000. Injections of antidiphtheric serum associated with the radiotherapy were followed by a further increase to 2,545,000, an amelioration of the general condition, and an increase in body weight. Examination of the blood after the injections and the application of the rays showed that a stimulation of the hematopoietic system had taken place, as evidenced by the presence of an increased number of red cells, an eosinophilia, and a polychromatophilia. On the other hand, the presence in the blood of the products of the destruction of the leukocytes by the rays or of hemolysins (which result from the serum injections) seems to be a necessary factor in determining a reaction of the blood-making organs.—*La Semaine médicale*, 1906, No. 11, p. 128.

Passive Congestion in Joint Disease.—DR. H. F. HARTWELL cites ten instances of tuberculous and gonorrhœal joint affections in all but one of which rather remarkable results were obtained by Bier's method of producing passive congestion. The congestion was caused by the application of an Esmarch bandage just long enough to encircle the limb two or three times at the desired tension and provided with strap and buckle at either end. The bandage should be applied just above the affected joint and secured by the buckle when the desired degree of congestion has been obtained; the skin may be protected by a few turns of an ordinary bandage; and to avoid stasis of blood in parts where it is not needed the limb which lies peripherally to the infected area may be snugly bandaged. Care should be taken lest the congested limb become cold to the touch and that the patient is not made uncomfortable and unable to perform his ordinary duties. In tuberculous joints the stasis is not kept up more than an hour daily; in severe gonorrhœal arthritides the congestion must be continued for ten or twelve hours and, while the strap is off, the limb should be elevated to reduce the œdema which the constriction has produced. Upon the subsidence of acute symptoms massage and passive motion should be instituted. Congestion produces no benefit in chronic hydrops after acute inflammation. In general, Hartwell states that the duration of the stasis should depend upon the effect obtained. If the patient observes that after an hour or two the pain is relieved and motion is increased, this length of time is sufficient, but if the symptoms soon return a longer period of congestion is necessary.—*Boston Medical and Surgical Journal*, 1905, No. 18, p. 483.

The Treatment of Insomnia.—WILLIAM BROADBENT (*The Practitioner*, 1906, No. 1, p. 1), in discussing this subject, states that one of the most frequent causes of insomnia is gastrointestinal derangement, especially when associated with flatulence, and while distention of any part of the digestive tract may give rise to dreams and broken rest, or definite wakefulness, it is gastric dyspepsia which gives nightmare, and dilatation of the stomach which produces the most obstinate sleeplessness; consequently, the treatment of insomnia due to these causes should be directed to the etiological factor and all digestive disorders should be rectified. The diet should be simplified and the stomach must never be distended. The amount of bread and of other farinaceous foods, of green vegetables, and of liquid with meals should be restricted, water, hot or cold being drunk every morning. One or two tablespoonfuls of brandy or whiskey in a claret glass of hot water as the only drink at luncheon and dinner will often be useful in dislodging gases. Treatment should be directed to the prevention of gastric or intestinal fermentation, for which purpose salol, naphthol, creosote, carbolic acid or sulphocarbolates may be given, not forgetting calomel or other mercurial, usually a very important consideration. In old persons vascular degeneration may have gone so far that no physiological state of the cerebral circulation conducing to sleep may be attainable; functional derangements, destruction of sleep, may be due to structural changes which cannot be modified; or an idiopathic condition of restlessness may be established; here, after palliatives have been tried, we may give sedatives without hesitation. Late in life there is no danger of inducing a drug habit, and a moderate dose of an opium preparation may conduce to the comfort of the patient and even prolong life. The chloral group is less to be relied upon than opium; the latter may be given nightly with colocynth and hyoscyamus to prevent constipation. In the young, caution is necessary; opium should be avoided and the patient should never be allowed access to sedatives at will. When the sleepless habit has become established sleep may be induced for three or four nights from time to time by one or other of the chloral group with a view toward breaking the habit, or if the patient's self-control is not to be relied upon, paraldehyde may be substituted. Broadbent believes that such drugs as sulphonal, trional, and veronal are doing incalculable harm.

The Physiological Action of Tea as a Beverage.—LAUDER BRUNTON (*Quarterly Journal of Inebriety*, 1906, No. 2, p. 19) sums up a paper with the following statements: 'Tea when properly prepared and taken in moderation is both useful and agreeable. When taken in too great quantity, or along with butchers' meat, when too strong, when infused too long, or still more when boiled and stewed, it is apt to produce digestive troubles. When taken in excess it may produce nervous symptoms of the most serious character, and facilitate, if it does not actually produce, mental degeneration.'

Expectorants.—H. EICHHORST (*Deut. med. Woch.*, 1906, No. 17, p. 649) considers that the irritating cough of tracheitis may be best relieved by 10 drops, three or four times daily, of codeine phosphate $4\frac{1}{2}$ grains and bitter almond water $2\frac{1}{2}$ drams. If the attacks of coughing are associated with nausea or if the appetite is poor he prescribes a mixture

containing codeine phosphate $4\frac{1}{2}$ grains, raspberry syrup 5 drams, phosphoric acid $7\frac{1}{2}$ grains, water 6 ounces; of this the patient takes two teaspoonfuls three times a day. He does not employ narcotics, other than codeine, because of their unpleasant by-effects. These are especially harmful when the bronchial secretion is copious, because of the possibility of producing cyanosis. True expectorants should have a solvent action upon tenacious sputum; in this connection the author recommends the following: potassium iodide 45 grains, simple syrup 5 drams, to which powdered ipecac $7\frac{1}{2}$ grains infused in 6 ounces of water is added; dose 2 drams every two hours. The depressant effects of apomorphine and pilocarpine contraindicate their employment, but a powder consisting of benzoic acid $4\frac{1}{2}$ grains, camphor $\frac{3}{4}$ grain, and powdered sugar 3 grains, may prove useful. In chronic processes with foetid expectoration the balsams are indicated, especially terebinthine and myrtol. In bronchial catarrh of the infectious type benzosol and benzoguaiacol are excellent, and the catarrhal inflammation may be lessened by the administration of 20 to 30 drops of the fluidextract of hydrastis four times daily. Steam inhalations also act as an expectorant and in certain instances rhythmic compression of the lower thorax will aid in the expectoration of tenacious mucus.

Marmorek's Serum by the Rectum in Tuberculosis.—M. PETIT (*Revue de Therapeutique*, 1906, No. 10, p. 337) has employed the following technique in the administration of this agent. Every two days, after a preliminary cleansing irrigation, 0.75 of a minim of the serum is injected, after which the patient rests for a time. Of twenty-seven patients so treated, seventeen have been improved and five no longer exhibit physical signs; five have died—all of whom were in the third stage of the disease. Under the treatment the first sign of amelioration is a disappearance of the dyspnoea, which generally takes place after about five injections; later the sputum disappears and finally the physical signs are modified. The general condition remains unchanged. Hemoptysis is not a contraindication, and the author has observed no unfavorable reaction of any kind; in his opinion the treatment seems specific and curative; at any rate it offers no disadvantages. In discussing the paper M. Le Gendre stated that the evidence presented could not, in his opinion, be considered seriously, since the cures or improvements had persisted not more than three or four months, and in consideration of the natural remissions which so often characterize the disease the results hardly constituted a sufficient proof of the efficacy of the treatment.

Thiocol in Non-tuberculous Pulmonary Affections.—M. NIGOUX (*Le Progrès médical*, 1906, No. 14, p. 215) considers that in thiocol we possess a very practical means of administering creosote in such affections as pneumonia, acute and chronic bronchitis, bronchiectasis, etc. The minimum dose, when the object is to drain the bronchi of the secretion, is 30 to 45 grains per day. A smaller dosage will suffice when it is not desirable to relieve the mucous membranes of inflammatory products. In a reported instance of emphysema, daily amounts of from 15 to 25 grains were sufficient to prevent exacerbations of bronchitis and pulmonary congestion. The drug also exercises an advantageous effect upon the digestive system which aids in augmenting the bodily resistance.

PEDIATRICS.

UNDER THE CHARGE OF

LOUIS STARR, M.D.,
OF PHILADELPHIA,

AND

THOMPSON S. WESTCOTT, M.D.,
OF PHILADELPHIA.

Early Diagnosis of Measles.—BRELET (*Archives Générales de Médecine*, 1906, lxxxiii, 669) discusses the different methods suggested to make a diagnosis of measles before the rash appears. During the period of incubation this is usually considered impossible. There are two signs during this period upon which some reliance can be placed. The first is Meunier's sign, a marked loss in the weight of the child; it is usually present and appears first about the third, fourth, or fifth day of incubation and eight to ten days before the eruption; the loss in weight averages about 60 grams per day; its cause is probably a disturbance of nutrition brought about by the measles infection. Meunier says the sign may be found in the incubation period of other infectious diseases as well, but considers it of value in cases in which children have been exposed to the infection; weighing them each day will show which of them is likely to develop measles. The second sign during this period is an increase in the number of leukocytes, especially the polynuclear forms. This leukocytosis, beginning with the period of incubation, increases rapidly and attains its maximum about the sixth day before the appearance of the rash; it then diminishes during the period of eruption and in cases of uncomplicated measles a leukopenia is present. At the period of invasion a number of signs have been described, which may assist in the diagnosis before the appearance of the rash, but the only one pathognomonic of the disease is Koplik's sign. It consists of rose-colored or bright-red spots having bluish-white centres; they are found on the mucous membrane of the cheeks and lips. The red spots, at first small and rounded, enlarge and may unite with the neighboring spots. The central point is the pathognomonic sign; it is very small, being from 0.2 to 0.6 mm. in diameter, is slightly raised and only removed from the surface with difficulty; the mucosa upon which the spot rests often presents a roughened appearance, which is very characteristic. Koplik's spots do not ulcerate; they disappear in three or four days. They may be few in number or very numerous, and never occur on the gums. They appear usually three days before the eruption and occur in from 80 to 100 per cent. of the cases. During the period of incubation, therefore, a diagnosis is rarely possible. At the stage of invasion, the presence of Koplik's spots, appearing as they do several days before the cutaneous rash, makes the diagnosis of measles certain.

Examination of Milk Bought in the Leipzig Market, with Special Reference to Streptococci.—H. BRUENING (*Jahrbuch f. Kinderheilkunde*, 1906, lxii, 1-22) reports having examined 40 samples of milk

(12 sterilized, 26 raw full milk, 2 buttermilk) during the summer months of 1904. Of the samples of raw milk, 7 were amphoteric, and 19 alkaline; the fat maximum was 4.05 per cent., the minimum 2.19 per cent., the average amount being 3.12 per cent.; 5 samples did not reach the amount of fat prescribed by law (2.8 per cent.). The 12 samples of sterilized milk were all free of bacteria; of the other 28 samples, 26 (93 per cent.) contained streptococci in varying quantities; 2 samples had 100 organisms to the c.c., 6 had 1000, 8 had 10,000, 8 had 100,000, and 2 had 1,000,000. There were two varieties of streptococci: the first, Gram-positive, composed of thick individuals, a few making a chain; they produced death in white mice within twenty-four hours. A second group consisted of Gram-negative, narrow diplococci, as well as similarly arranged Gram-positive organisms, non-pathogenic to white mice and guinea-pigs. The streptococci were not present in milk immediately after milking, as proved by a number of samples taken directly from the animals; they entered the milk during transmission to market and are probably chiefly saprophytic. When fed to animals they were found to be absolutely innocuous, but as epidemics of dysentery have been reported in cases in which the only organisms found were these same non-pathogenic bacteria, these streptococci deserve attention at the hands of bacteriologists and specialists in children's diseases. A number of observers have discussed the possibility of a relation between them and the summer diarrhoeas of children.

Bronchopneumonia and Pyemia following Measles.—J. MCKENZIE (*Lancet*, 1906, i, 1315) reports the case of a child of twenty months, with a history of having been in good health and found suffering from an attack of measles associated with delirium. The rash appeared on the fourth day of the illness, and on that date, except for the delirium, there was nothing exceptional about the case. On the sixth and seventh days of the illness the rash had almost disappeared, but the temperature had not dropped to normal and the child was very restless and delirious. Evidence of commencing pulmonary consolidation could be detected at the left base, but the nervous symptoms were not such as one might expect at the beginning of an uncomplicated pneumonia with moderate temperature. No evidence of meningitis or osteomyelitis could be found. The delirium persisted until the end, which occurred on the eleventh day of the disease. The most prominent features were the persistent delirium with moderate temperature and the very rapid and advanced consolidation of the left pulmonary base. The autopsy revealed red hepatization of the lower left lobe and minute abscesses scattered over all the organs of the body. Bacteriological examination of the fluid from the lungs, spleen, pericardial and cerebrospinal cavities, showed the presence of *Staphylococcus aureus*. The case is curious because of the staphylococcus inducing a pulmonary consolidation; because of the rapidity with which the lower lobe became atelectatic; because of the virulence of the organism giving rise to embolic infection of the various internal organs; and because of the constitutional symptoms of the intoxication overshadowing the effects of the local pulmonary lesion.

Nervous Complications in the Typhoid Fever of Children.—G. B. ALLARIA (*Gazzetta degli Ospedali*, 1906, xxxvii, 17) describes several cases of typhoid fever in children complicated with affections of the nervous

system. The first patient, a girl, aged six years, developed meningismus, right-sided spastic hemiparesis, and aphasia; the second, a boy, aged six years, developed in addition Jacksonian epilepsy. Both patients recovered completely. There was no cardiac or renal disease. In the first patient's case the right hemiparesis developed in the fourth week of the illness, was followed three days later by neck rigidity, and later by motor aphasia, which lasted three weeks. The second patient developed the meningeal symptoms during the second week, motor aphasia in the third week, and right-arm Jacksonian epilepsy in the fourth week. Lumbar puncture gave some temporary relief. The increased knee-jerks persisted on the right side; the aphasia lasted two weeks. A third patient, a girl, aged eight years, died as the result of a typhoid meningitis. Most of the typhoid paralyses, as seen in the first two cases, come on gradually, and have no relation to the gravity or intensity of the intestinal lesion. They are often accompanied by irregularities in temperature, perhaps due to irritation of the heat centres. The differential diagnosis between a toxic and organic paralysis is difficult, and all the more if there are symptoms of meningismus present, although these latter are rare in typhoid. The cerebrospinal fluid gives the best clue in their differentiation. The fourth patient had tetany complicating the typhoid.

Malignant Teratoma of the Ovary.—L. S. DUDGEON (*Jour. Obstet. and Gyn. Brit. Empire*, 1906, ix, 28) reports the case of a child, aged four years, who had always been well until within a few months; since then her abdomen had gradually enlarged. Examination showed the abdomen to be occupied by a large mass; its upper border reached the costal margin, its lower, the pelvic brim; fluctuation could be detected. The abdomen continued to increase in size, marked abdominal pains developed, the right foot became cedematous, and tapping removed a large quantity of thick, greenish fluid. She died five months after admission to the hospital; before death, numerous nodules appeared all over the abdomen and scattered hemorrhages covered the skin. The autopsy revealed a cystic tumor of the left ovary, filling the abdominal cavity, but not adherent anywhere; one secondary nodule was found in the liver. The surface of the tumor was irregular, with cystic and hard projections all over its external surface. Microscopic examination showed the tumor to be of the class of teratomas. An excellent microscopic description of the tumor is given, well illustrated by pictures. Dudgeon says that the earliest age at which such a condition has thus far been described is six years.

Lavage in Acute and Chronic Gastritis of Children.—E. L. COOLIDGE (*Bull. Lying-in Hosp., New York*, December, 1905, ii) prefers stomach washing to any of the treatments for acute and chronic gastritis in infants. One single washing often suffices in acute gastritis; in semi-chronic or chronic cases daily lavage may be necessary for a time. In addition, the food, bowels, and general hygiene of the infant's life must be rectified. A No. 16 catheter with a large eye is attached by means of glass tubing to a rubber tube, to which a 4 to 6 ounce glass funnel is fitted. Previously boiled water cooled to 100 to 110° is employed; a teaspoonful of bicarbonate of soda is added to the quart of water when much mucus exists. The child is held upright in the mother's lap;

a rubber sheet is tied around it. The tube is lubricated with olive oil, and passed rapidly through the pharynx and oesophagus into the stomach; from eight to ten inches of tube will thus be swallowed. Gas and food are permitted to escape, four to six ounces of water poured in, and the water, food, and mucus siphoned out. After the water comes away clear, the tube is removed. In chronic cases, or when there is much prostration, it is an excellent plan to leave in the stomach an ounce of fresh, hot water, together with a dram of a good liquid beef preparation. The lavage should be performed two and one-half to three hours after feeding and no food should be given for an hour afterward, the child during that time lying on its back. Two cases are reported in detail.

The Economic Production and Distribution of Clean Milk.—J. ROBY (*Jour. Amer. Med. Assoc.*, 1906, xvi, 1430) demonstrates how remarkably clean milk can be produced without an expensive plant, citing the case of a farmer with but a cheap outfit. He counts up the steps necessary to produce such a milk, and lastly describes a scheme to improve the entire milk supply of large cities. The rules to produce clean milk are as follows: (1) It must be protected from infection by scarlet fever, diphtheria and typhoid by removing the patient from the farm; (2) it must be cooled at once and kept cold, or at least below 50°; (3) the utensils must be kept clean, or better still, sterile; (4) milking should be done through a sterile cheese-cloth into a pail with a small (five inch) opening; (5) the pail must be kept tightly covered. These five points are absolutely necessary to produce milk containing a low number of bacteria; if the rest of the points are obeyed, a milk containing probably no more than 1000 bacteria to the c.cm. will be produced. (6) Discard the first draw from each teat; (7) keep the cow absolutely clean; (8) keep the milker's hands and clothes clean; (9) keep the ceiling free from dust; preferably it should be lathed and plastered; (10) keep the barn clean and use shavings for bedding instead of straw; (11) dust should not be stirred just before or at time of milking. The scheme for improving the milk supply is, that the city have a can sterilizing plant. The cans must first be washed, the cheese-cloth put over them, then the metal cover, and lastly, a canvas cover with a purse-string to keep it free from dust. The cans are sterilized by dry heat, shipped back to the farmer, who milks directly through the cheese-cloth. He removes the cheese-cloth, replaces the cover and sinks the can into ice-water up to its neck. Then the whole outfit is returned to the city to be bottled or delivered directly. Milk thus handled is said by the author to contain less than 500 bacteria to the c.cm.

OBSTETRICS.

UNDER THE CHARGE OF

EDWARD P. DAVIS, A.M., M.D.,

PROFESSOR OF OBSTETRICS IN THE JEFFERSON MEDICAL COLLEGE, PHILADELPHIA.

Anesthesia during Labor by Scopolamine-morphine Injection.—GAUSS (*Archiv. f. Gyn.*, 1906, Band lxxviii, Heft 3) reports the results following the injection of scopolamine-morphine in 500 cases of labor

at the Clinic in Freiburg. These patients illustrated the various complications of labor, and among them the different obstetric operations were performed. The preparation employed was Merck's and the result of the injections so far as labor was concerned was satisfactory. Patients differed in the cerebral symptoms produced by these injections in accordance with the susceptibility of the nervous system. So far as the performance of obstetrical operations was concerned, in a few cases the use of forceps, suture of the perineum, and in one case hebotomy, were done without other anesthesia. In most cases, however, additional anesthesia was required. The patient's injection did not seem to be an unfavorable element in the use of another anesthetic. A solution of 0.03 per cent. of scopolamine and 1 per cent. of morphine in sterile distilled water was that most usually employed. In quantity a dose of 0.00045 to 0.0006 hydrobromate of scopolamine with 0.01 morphine was employed. If this failed to produce a result a second injection of 0.00015 to 0.0003 scopolamine was given without morphine. If in from two to four hours no result followed, then 0.005 morphine was added. The time required to produce an effect varied from one-half hour to fifty-seven hours. The majority of cases, however, experienced marked relief within two to six hours after the injection. The longest time through which the effect endured was forty-eight hours, during which a patient was treated in this manner. The results of this treatment are analyzed in detail, as regards the mother's general condition, labor pains, abdominal pressure, length of labor, necessity for operation, and the effect upon the child. It was impossible to trace injurious effects, in any of these particulars, to the injection. The conclusion is reached that the use of this material is without injurious effect, does not interfere with other anesthesia if necessary, and that it causes great comfort to the patient in labor. It seems contraindicated when labor pains are extraordinarily weak, when a patient is already depressed by hemorrhage or by infection, although in eclampsia its use seemed to be indicated. So far as could be observed no unfavorable results of any sort followed its employment.

Puerperal Lumbar Neuritis.—HAUCH (*Zeit. f. Geb. u. Gyn.*, Band lvii, H. 2, 1906) contributes a paper upon this subject, reviewing the literature and reporting cases of his own. In the Maternity Wards at Copenhagen in 680 parturient patients, neuritis was found in 32 (or 4.7 per cent.). The symptoms were pain on pressure over the nerves, paresis, pain in the nerves, hyperesthesia of the skin, and in some cases, increase of the patellar reflex. The nerves affected were mostly the crural and sometimes other nerves of the lower extremities. As typical of the condition, he describes the case of an unmarried primipara, somewhat anemic, who had suffered from prolonged nausea during pregnancy. She had also albuminuria. Labor was spontaneous; the child living, but the mother's recovery was complicated by great sensitiveness on pressure in the crural and saphenous nerves, with great pain on moving the lower extremities, hyperesthesia of the skin, and increased patellar reflex. The electric reaction was unchanged. The patient made a spontaneous recovery with no other treatment than rest in bed and good food. The author tabulates his thirty-two cases, describing the symptoms, course of labor, and giving other details. Sensibility to heat and cold was unchanged in all cases. Reaction to

electricity was also normal, and in but one case was there disturbance of the trophic or vasomotor function. There were varying paresis and disability in accordance with the generally depressed condition of the patient. It could not be observed that the size of the pelvis or the position or presentation of the child had any influence upon the occurrence of neuritis. In nine cases in the thirty-two the patient had nausea during pregnancy. This draws attention to the theory advanced that both nausea and neuritis are caused by toxemia. In five cases a mild influenza was present during the puerperal period. In thirty-one of the thirty-two cases labor was spontaneous. The condition seems one of neurasthenia, accompanying in many cases anemia and toxemia also. Hauch, however, reviews the pathology of the condition, and is inclined to believe that puerperal neuritis is the result of an acute intoxication which attacks the nerve filaments, but which lasts only a short time. He believes that various circumstances may make the inflammation better or worse, and that this accounts for the variation in the different cases. The diagnosis between neuritis and phlebitis is usually not difficult. In phlebitis the tenderness is usually in Scarpa's triangle; in phlebitis the veins are swollen and can be distinguished and there are oedema and fever; the patient frequently cannot move the limb and the pain does not extend along the nerve trunks, nor is the skin as sensitive as in neuritis. The diagnosis between hysterical paresis and neuritis is often difficult to make. The prognosis is good. Most patients recover in eight or ten days; occasionally one persists for two or three weeks. The treatment is entirely symptomatic and hygienic.

Extirpation of the Spleen during Pregnancy.—SCHAUTA (*Zentrabl. f. Gyn.*, 1906, No. 25) reports the case of a pregnant patient, two months advanced, who had in addition a tumor close to the uterus. As pregnancy advanced the tumor could be separated from the womb and abdominal section was performed about the fourth month. It was found to be an enlarged spleen and was removed without especial difficulty by a transverse suprapubic incision. The patient made an excellent recovery. On the day of operation examination of the blood showed 5,350,000 red and 28,000 white blood cells. Eight days after operation the red cells were not especially altered and but slightly decreased in quantity, while the white cells had fallen to 16,600. Three months after operation the red cells were 3,860,000; the white, 14,900. Removal of the spleen is a rare operation during pregnancy and the statistics of the subject are very meager.

Frozen Section through the Body of a Parturient Patient Dying during the Expulsive Period of Labor.—BUMM and BLUMREICH (*Zeit. f. Geb. u. Gyn.*, 1906, Band lvii, H. 2) describe a recent frozen section made through the body of a patient dying in labor. The woman was a primipara, aged thirty-nine years, previously healthy, with practically normal pelvis, with the fetus in normal position and presentation. After the membranes had ruptured and while the labor pains were continuing and the patient seemed in perfectly normal condition, she suddenly became cyanotic, with well-marked dyspnoea, and suddenly died. On examination the head of the child was deep in the pelvis, the occiput on the left side and anterior. The child's heart sounds

had ceased. Eleven hours after death the body was placed in a cold mixture and thoroughly frozen. On the sixth day sections were made in such a position as to open the genital tract anteroposteriorly. Photographs were then taken and the specimens were then placed in 4 per cent. formalin for two weeks. Examination of the specimen showed that below the contraction ring there was a considerable area of tissue covered by decidua, and then a portion 4 cm. long of cervical mucous membrane. The specimen showed very plainly a contraction ring whose lower portion was considerably dilated. The cervix, and the cervix only, extended from the vagina to the uterus proper, while above this the uterine muscle could distinctly be demonstrated, and undoubtedly was capable of contraction during labor.

Thrombosis of the Placental Vein, with Intrauterine Death of the Fœtus.—MATHES (*Zentralb. f. Gyn.*, No. 25, 1906) reports the case of a primipara, aged thirty-nine years. There was protrusion of the uterus and abdominal contents, and rachitic pelvis. The patient was admitted to the hospital in labor; but soon after her entrance foetal heart sounds could not be heard. Labor lasted but seven and one-half hours, terminating spontaneously; the amniotic liquid was discolored when the membranes ruptured. The child had died but a short time before birth, as signs of maceration or change were absent. On examining the placenta the attachment to the umbilical cord was eccentric; the vessels of the chorion on the foetal side were filled with blood, and one of the veins running to the cord was thick and greatly distended with blood. The placental tissue about the vein was infiltrated with blood and greatly thickened. The vein itself was hard, and when cut across, exuded dark blood and also threads of fibrin; the vein was then incised lengthwise, when it was found to be the site of thrombosis. Microscopic examination showed the characteristic structure of a thrombus and also the fact that the endothelium had disappeared from the inner aspect of the vein. On the inner layer of the muscular tissue there were also masses of leukocytes.

OPHTHALMOLOGY.

UNDER THE CHARGE OF

EDWARD JACKSON A.M., M.D.,
OF DENVER, COLORADO,

AND

T. B. SCHNEIDEMAN, A.M., M.D.,
PROFESSOR OF DISEASES OF THE EYE IN THE PHILADELPHIA POLYCLINIC.

The Refraction of the Newborn.—ELSCHNIG (*Zeitschr. f. Augenh.*, 1906, vol. x) has frequently found in children, two hours to two days after birth, a myopia from 4 to 7 D., disappearing after atropine, and

giving place to low hypermetropia. Such spasm of the accommodation may be due to an abnormal reaction of the eye to the first luminous excitations. Some newborn infants are hypermetropic or emmetropic at birth; in these cases the pupils are dilated and the eyeballs almost immobile.

Eumidine (Nitrate of Methylatropine), a New Mydriatic.—DEL MONTE (reviewed in *Arch. d'Ophthal.*, July, 1906) brings forward a new mydriatic, nitrate of methylatropine. Upon healthy and diseased irides, it acts, in equal doses with atropine more slowly, with less energy, and its effect is not so lasting; on the other hand, it is less toxic and appears to have no influence upon the tension. It can be substituted for atropine in children, the aged, and when the latter is not well borne. In 0.5 per cent. solution it acts more rapidly than homatropine, but its effects last about ten hours longer; this can be decidedly shortened by pilocarpine, rendering eumidine preferable when dilatation of the pupil is desired for ophthalmoscopic examination.

The Symptoms of Disease of the Cerebral Peduncles, Especially those Affecting the Eyes.—MOERCHEN (*Ztschr. f. Augenh.*, 1906, vol. x) emphasizes a characteristic symptom: Superior alternating hemiplegia or syndrome of Weber; namely, hemiplegia of the side opposite the lesion with paralysis of the oculomotor nerve of the diseased side. This syndrome was found in forty-one of fifty-three cases; the facial was also involved in ten cases, and the hypoglossal in three. The paralyses vary in degree, but ptosis upon one side with paresis of a member of the opposite side are sufficient to establish the diagnosis. Instead of paresis, trembling or choreic movements have been noted, Benedict's syndrome. Disturbances of speech are likewise pathognomonic of a lesion of the left cerebral peduncle, if they are accompanied by a superior alternating hemiplegia. The branches of the oculomotor are involved in frequency as follows: the elevator, internal rectus, superior rectus, inferior oblique. In most cases ophthalmoplegia interna is also present. The pupil is immovable to reflex stimulation in some cases. It is rare for the paralysis to affect the third pair in their entirety, but sometimes, when the lesion involves the nuclei, certain branches of both sides are affected. "Choked" disk is very rare; it has been found in only 6 per cent. The visual disturbances are due either to papillitis or to secondary compression of the optic tracts. All other symptoms which have appeared in published cases are only "phenomena of contiguity."

The Ocular Symptoms in Disease of the Temporal Lobes.—KRÜGER (*Ztschr. f. Augenh.*, 1906, vol. x) finds local symptoms pointing to disease of the temporal lobes as follows: (1) Disturbances of speech in 27 per cent. These depend frequently not upon a cortical lesion, but are due to a lesion of the associated tracts. (2) Disturbances of audition, explicable by the termination of the auditory nerve in the temporal lobes; deafness of both ears is found when an extensive sarcoma compresses both temporal lobes; tinnitus is also present. Olfactory disturbances are rare. The ocular symptoms observed are never symptoms of localization. Hemianopsia is present in 14 per cent.; it is due to a lesion of the optic fibers which traverse the lower region of

the temporal lobe. Conjugate reaction is rarely seen. Immobility of the pupils, optic atrophy, and neuroretinitis are found in 14 per cent. They show nothing characteristic. The disturbances of the pupil depend upon lesions of the optic nerve. Nystagnus has been observed occasionally. The paralyses of the motor nerves are due to secondary compression at the base.

DISEASES OF THE LARYNX AND CONTIGUOUS STRUCTURES.

UNDER THE CHARGE OF

J. SOLIS-COHEN, M.D.,
OF PHILADELPHIA.

Unusual Motility of the Tongue.—TAPIA (*Revue hebdomadaire de laryngologie, d'otologie, et de rhinologie*, July 7, 1906) reports a case in which the subject, a young student of medicine, could place his tongue into either posterior nasal passage, and could detect the orifice of the pharyngeal bursa and its prolongations into one median and two lateral recesses on either side—in all five depressions—in his hypertrophied pharyngeal tonsil. He could also feel with his tongue the anatomical details of his rhinopharynx, such as the posterior border of the septum, the ends of the turbinates, and the orifices of the Eustachian tubes, etc.

Velopalatine Angioma.—BAR (*Annales des maladies de l'oreille, du larynx, du nez, et du pharynx*, July, 1905) reports an example of this rare lesion in a rheumatic man, some fifty years of age. The growth was the size of a half-cherry and extended from the uvula, which it had enveloped, as far as the superior border of the right anterior pillar. It was treated by galvanopuncture, which it was hoped would be successful.

Primary Syphilitic Infection in the Nose.—JAMES T. CAMPBELL (*Annals of Otology, Rhinology, and Laryngology*, June, 1906) reports a case of primary syphilitic infection in the nose of a surgeon in perfect health who had circumcised a patient upon whose prepuce there was a large indurated chancre. The lesion occupied the anterior end of the right inferior turbinated body. The character of the infection was not recognized until the appearance of a macular rash upon the abdomen some eighty days after the probable inoculation. After six inunctions of mercurial ointment, one dram each at bedtime, all evidences of the disease had disappeared. Preceding the report of this case is a succinct summary of the bibliography on the subject; and likewise of its diagnosis.

Adenocarcinoma of the Nose.—FIOCRE (*Archives internationales de laryngologie, d'otologie, et de rhinologie*, Mai-Juin, 1906, p. 1094) reports an instance of adenocarcinoma of the nose, latent in evolution,

and without epistaxis or other premonitory symptoms, in a woman aged seventy-three years. It was attached only to the inferior and middle turbinals and was readily removed with gouge and forceps. Histologically, it was a myxo-adenoma with manifest tendency to carcinomatous evolution. No postoperative treatment was required. There was no recurrence.

The Importance of a Microscopic Examination of All Growths Removed from the Nares, together with a Report of Early Diagnosis of Malignant Growths.—SYLVAN ROSENHEIM (*Johns Hopkins Hospital Bulletin*, June, 1906), after intimating that intranasal tuberculosis and malignant neoplasms are more frequent than are usually known, and that, therefore, all growths removed from the nose should be systematically examined, reports six cases, two of which are illustrated, in evidence of the correctness of the importance of his views.

Adenosarcoma of the Nose.—FIOCRE (*Revue hebdomadaire de laryngologie, d'otologie, et de rhinologie*, July 7, 1906) reports a case of adenosarcoma of the nose. The patient was a woman, aged sixty-three years, in whose right nasal fossa a tumor had developed at the expense of the middle and inferior turbinals. It was completely removed with forceps and gouge in three sittings. There had been no recurrence at the end of six months.

Osteocalcareous Growth in the Nose.—H. B. LEMERE (*Jour. Amer. Med. Assoc.*, July 28, 1906) reports a large osteocalcareous tumor in the nose of a girl aged fifteen years. It was removed with trephine and chisel after several days' work.

Epitheliosarcoma of the Ethmoid.—VACHER (*Annales des maladies de l'oreille, du larynx, du nez, et du pharynx*, Mars, 1906) reports a successful operation upon a man, aged seventy-nine years, for an epitheliosarcoma of the ethmoid, which had invaded the two frontal sinuses, the left sphenoidal sinus, and the left maxillary sinus.

Heredity in the Diseases of the Accessory Sinuses.—BICHATON (*Revue hebdomadaire de laryngologie, d'otologie, et de rhinologie*, June 23, 1906) contributes a paper in which he contends that heredity is a great factor in the diseases of the accessory sinuses of the nose, and reports five cases in support of his contention.

Infectious Frontal Sinusitis with Local Necrosis and Pulmonary Gangrene.

CASTEX (*Revue hebdomadaire de laryngologie, d'otologie, et de rhinologie*, June 23, 1906) reports a case of a young man recovering from scarlatina, complicated with nephritis, who sniffed up borated water to cleanse his nasal passages. Double frontal sinusitis supervened, requiring two operations, opening largely the two frontal sinuses and the ethmoidal labyrinth; two sequestra were removed at the second operation and the opening was further enlarged. Pulmonary gangrene with fetid sputa set in eight days later. Colloidal silver was employed by friction and by injection, and recovery ensued.

DERMATOLOGY.

 UNDER THE CHARGE OF

LOUIS A. DUHRING, M.D.,

PROFESSOR OF DERMATOLOGY IN THE UNIVERSITY OF PENNSYLVANIA,

AND

MILTON B. HARTZELL, M.D.

ASSOCIATE IN DERMATOLOGY IN THE UNIVERSITY OF PENNSYLVANIA.

The Relationship Between Hydroa Estivale and Hematoporphyrinuria.—

LINSER (*Archiv. f. Dermatologie und Syphilis*, Band lxxix, Hefte 2 und 3) reports the following exceedingly interesting case observed in Romberg's clinic at Tübingen: A man, aged forty-four years, had suffered every summer since his sixth year from an eruption of vesicles situated upon the hands and face which disappeared in the winter, leaving numerous scars. These repeated attacks had produced a cicatricial condition of the entire face, with marked deformity of the ears, upper lip, nose, and fingers, the terminal phalanges of both index fingers being lost. (The patient had observed that the eruption was always most severe after exposure to the sun, and that his urine at this time was always dark, whereas, in the winter it was clear.) Upon his reception in the clinic there were present numerous small ulcers in the midst of the scar-tissue on the face and hands. After exposing the hands to the Röntgen rays for the purpose of making skiagrams, the urine became dark red and gave the characteristic spectrum of hematoporphyrin. Later the patient was exposed to the light of an electric arc lamp for some time, and this was followed by marked reddening of the face, with a burning sensation and the appearance of hematoporphyrin in the urine again. Exposure to hot air and to ordinary light had no effect upon the skin or urine.

Lymphadenomatous Prurigo.—DUBREUILH (*Brit. Jour. of Dermatology*, May, 1906, p. 197) refers to cases in the literature in which there occurred small and large lymphatic nodules accompanied with itching, without apparent leukocytosis in the majority of cases recorded. In some there was papular eruption upon the skin, of the form known as prurigo, in others there was merely intense itching without eruption. The author records two cases in which there was general enlargement of glands with intense itching and progressive wasting and loss of power. In one case the blood showed 1 white to 145 red corpuscles; of the white cells 90 per cent. were polynuclears. In the other cases there was also pronounced leukocytosis, with 91 per cent. polynuclears. The skin in the first case showed a number of lymphoid nodules, formed of cells resembling lymphocytes, with a nucleus, round or oval, separated by a very fine network of connective tissue. The sweat glands were much altered, the coils dilated, the lumen filled up with cells. The bloodvessels showed no changes. The skin was otherwise normal.

The Inclusions Found in Lupus Tissue.—PICK (*Archiv. f. Dermatologie und Syphilis*, Band lxxviii, Hefte 2 und 3) from a study of the

peculiar cell inclusions occasionally found in the tissue of lupus vulgaris concludes that these have nothing to do whatsoever with parasites, and that they especially are not blastomycetes, as Pelagatti believes. They probably arise from the deposition of lime and iron in and around resistant tissue elements of different kinds. In the case observed by Pick it was the lanugo hairs which served as the foreign bodies.

Effect of the Finsen Light upon Normal and Tattooed Skin.—MEIROWSKY-GRAUDENZ (*Monatshefte f. Praktische Dermatologie*, Band, xlii, No. 8), as the result of his study of numerous specimens of human skin which had been subjected to the action of the light of the Finsen-Reyn lamp, concludes as follows: The light incites the epithelial cells to increased activity, which becomes evident through nuclear-division figures and the new formation of pigment. Longer action produces enormous injury to the epidermis which goes through a series of degenerative changes, finally becomes necrotic, and is elevated in blebs. Simultaneously with this injury a dilatation of the superficial and deep vessels appears, which has as a consequence an abundant emigration of leukocytes and hemorrhages into the tissues. The light likewise brings about an increase of the connective-tissue cells and a swelling of the collagen. After the inflammatory phenomena have reached their acme reparation begins with a marked increase in the thickness of the prickle-cell layer, whose cells, in the beginning without pigment, later show an increase and new formation of pigment in all the layers of the epithelium. In the connective tissue the oedema disappears, and there finally remains hyperpigmentation in the prickle-cell layer and a marked increase of the collagen. In the tattooed skin the Finsen light, by producing necrosis, makes possible the exit of pigment granules lying deeply in the corium.

PATHOLOGY AND BACTERIOLOGY.

UNDER THE CHARGE OF

WARFIELD T. LONGCOPE, M.D.,

DIRECTOR OF THE AYER CLINICAL LABORATORY, PENNSYLVANIA HOSPITAL,

ASSISTED BY

G. CANBY ROBINSON, M.D.,

RESIDENT PATHOLOGIST, PENNSYLVANIA HOSPITAL, PHILADELPHIA.

Studies in Absorption. BUXTON and TORRY (*Jour. Med. Research*, 1906, xv, p. 5) present an extensive study of absorption from the peritoneal cavity. The absorption of inert particles (lamp-black and red blood cells of chickens) and bacteria (typhoid bacilli) has been made the subject of a large number of experiments, the results of which are presented in five separate papers.

First, the subject of absorption of inert particles was studied by intraperitoneal injections of 3 c.c. of lamp-black suspensions. The

animals (guinea-pigs) were then killed and examined at various periods of time following the injections.

The peritoneal fluid was examined, and a leukopenia in the fluid occurred, which lasted from one to three or four hours. Then, in two to six hours, phagocytic leukocytes appear, and take up lamp-black rapidly; while in twenty-four hours, the mononuclear macrophages (large phagocytic cells, probably derived from connective tissue) appear. These latter cells play an important role in ingesting chickens' red cells; but it is a question whether their role is important with lamp-black.

On examining the spleens and livers of the guinea-pigs, it was found that the lamp-black reached these organs in fifteen minutes, when more was found than in animals killed thirty to sixty minutes after injection. In four hours, the amount present had greatly increased. This fluctuation in the amount of lamp-black present in the organs was seen to occur, so that at twenty-four hours, and again in four days, a maximum amount was present. An excretion and a renewal of particles must occur in the organs, but for this the authors offer no explanation.

Secondly, the absorption of typhoid bacilli from the peritoneum was examined. Rabbits were used. The animals were bled to death, in order to carry away the bacilli in the blood as far as possible; and the peritoneum was washed out with salt-solution at the time of death. The number of bacilli in the wash-water, various organs, and fluids was determined by plating. It was found that the number of bacilli in the wash-water and various organs varied greatly, and the time between the injections and examinations was not an index to their number. On the other hand, there may be an "explosive destruction" of a vast majority of the bacilli, few or none reaching the organs in such cases. The organs were practically sterile in three of seven rabbits examined ten to fifteen minutes after injection, the number in the wash-water being also greatly reduced, while bacilli swarmed in the organs and were in millions in the wash-water of the other four animals examined after the same length of time.

There may be a slower destruction, which is practically complete within an hour; but then large numbers of bacilli find their way into the circulation and are deposited by the blood in the various organs. The number of bacilli in the organs rapidly decreases after the first few minutes, up to about two hours after inoculation; but from seven to eight hours there is a considerable increase in their numbers, probably due to multiplication after the body fluids have expended all their destructive energy. From six to forty-eight hours there is again a decrease, probably mostly due to phagocytosis. Thus we see the variation in numbers of bacilli at varying lengths of time after injection follows the same changes as the inert particles. The bile and urine did not appear to be channels of excretion under the conditions of the experiments, *i. e.*, without lesions of liver and kidneys.

Thirdly, the function of the diaphragm in absorption is discussed. The authors found that an immediate rush of particles to the lymphatics of the diaphragm followed the intraperitoneal injections. The particles almost immediately reach the circulation by way of the lymphatics of the anterior mediastinum and thoracic duct, and so reach the organs in the earliest stages practically in a free condition. The particles are found, during the ten or eighteen minutes after injection, free in the lymphatic ducts and in the afferent ducts of the lymph glands; while later, they are all through the glands, largely within wandering cells. In the anterior,

mediastinal lymph nodes, the macrophages are the principal phagocytes; and the leukocytes play a comparatively minor part, not only with inert particles and animal cells, but also with bacteria. The authors are not able to decide whether the particles pass into the lymphatics through stomata, or whether they pass between the lining endothelial cells.

The fourth paper deals with the function of the omentum in absorbing inert particles. It is found that almost immediately after injection, fibrin accumulates on the omentum, and entangles particles and phagocytes. Here phagocytosis of lamp-black occurs in about ten minutes, and of chicken red cells in about one hour. If not overcrowded, the macrophages enter the omentum and appear as "trailers," or elasmato-cytes, where the chicken red cells are soon ingested, while the lamp-black is retained for months. The macrophages are the most active agents of phagocytosis on the omentum, while the leukocytes play a minor part. The mesenteric lymph glands do not share in the initial rush of particles, such as is seen in the anterior mediastinal glands, and, to a less extent, in the omental glands.

The fifth paper consists of a discussion of the part played by the omentum in absorbing bacteria. The omenta of about ninety rabbits and seventy-five guinea-pigs were examined in this investigation. Typhoid bacilli became fixed in immense numbers to the omentum, like inert particles, by fibrin or over the "milky spots" seen in the omentum. Some bacilli may be in macrophages. The bacilli may be rapidly destroyed, both intracellularly and extracellularly; and do not reach the organs, as was seen in three of the seven cases examined immediately after injection. On the other hand, if there is a poor reaction of polynuclear leukocytes, the principal factors in rapid destruction, multiplication may occur "in vivo;" and so the increase in from four to six hours, before mentioned, is explained. These secondary centres of multiplication are not found in sixteen to twenty-four hours in animals that are recovering, while they are marked features if the animal is dying or dies between these times. As with inert particles, the macrophages are the chief factors in phagocytosis; but they cannot dispose of the bacteria by lysis without the presence of polynuclear leukocytes.

Experimental Neurotic Œdema of the Lungs.—JORES (*Deut. Arch. f. klin. Med.*, 1906, lxxxvii, 389) in attempting to find some explanation for certain types of œdema of the lungs, inserted one end of a small glass cannula into a branch of one of the main bronchi of a dog, and connected the other end of the cannula with a flask filled with carbon-dioxide. After twenty minutes, the dog was killed, and the lower lobe of the left lung, the area supplied by the cannula, was found to be markedly œdematous, while the remainder of the lung showed no marked alteration.

The experiment was repeated with various modifications, and it was found that the only explanation for the occurrence of œdema in this case seemed to be the mechanical irritation of the tube in the finer bronchi. Local asphyxia from aspiration of carbon dioxide or hindrance to respiration did not produce œdema; nor did interference with respiration, caused by section of the phrenic nerve or section of the cervical spinal cord, give rise to œdema. Closure of branches of the

bronchi, combined with compression of the pulmonary veins, likewise yielded negative results. Finally, irritation of localized areas of the lungs was resorted to, by means of a faradic current. The experiments were conducted both with and without a Sauerbruch's chamber. Stimulation by the faradic current of the surface of the lung produced definite œdema localized to the area irritated. Jores believes that the œdema is due to the stimulation of the vasomotor nerves by the electric current, and not to a direct action upon the musculature of the vessel-walls. This point does not, however, seem to be clearly established. The right vagus of a rabbit was severed, and three weeks later localized œdema of the right lung was produced by faradic stimulation of the surface. Jores argues that the vasomotor nerve may reach the lung through the sympathetic system, but the correctness of this supposition could not be proved; for all the animals operated upon died before the experiments could be completed. Section of both vagi at three to nine day intervals, with stimulation of the peripheral stump of the nerve first cut, occasionally gave rise to slight œdema of the lungs. Jores considers that a neuropathic type of lung œdema in man may be of importance in explaining certain varieties of this condition.

HYGIENE AND PUBLIC HEALTH.

UNDER THE CHARGE OF

CHARLES HARRINGTON, M.D.,

PROFESSOR OF HYGIENE IN THE HARVARD MEDICAL SCHOOL, BOSTON.

Bactericidal Action of Silver Compounds.—At the request of the Therapeutic Committee of the British Medical Association, C. R. MARSHALL and E. F. M. NEAVE have investigated the germicidal power of the various silver preparations, fifteen in number, in common use. As test objects were used a mixed culture obtained by allowing raw beef to stand from four to six weeks in water in an open vessel, and a pure culture of *Staphylococcus pyogenes aureus*. The conclusions arrived at (*Brit. Med. Jour.*, August 18, 1906, p. 362) are as follows: The experiments show that as regards bactericidal action the various silver compounds investigated fall into three groups: (1) Those which are powerfully bactericidal; (2) one, nargol—much less powerfully bactericidal; (3) two, argyrol and collargol—which possess practically no bactericidal action whatever. The first group includes silver nitrate, silver fluoride, actol, itrol, argentamine, argentol, albargin, argonin, ichthargan, largin, novargan, and protargol. The bactericidal action of these, in solutions containing the same percentage of combined silver, is closely similar, and it is practically impossible to place them in any order of activity which would be true under all circumstances. As argyrol and collargol are not bactericidal, it is evident that the amount of silver which a compound may contain is no criterion of its bactericidal power. Moreover, in view of the results obtained with argyrol, it seems

impossible to attribute the good effects which many clinicians have obtained with it to its bactericidal action.

The percentage of metallic silver in each preparation was determined in advance. The results follow: Collargol, 86.6; silver fluoride, 81.7; silver nitrate, 63.6; itrol, 60.8; actol, 51.5; argentol, 31.2; ichthargan 27.1; argyrol, 20; albargin, 13.4; nargol, 9.6; largin, 9.4; novargan, 7.9; protargol, 7.4; argentamine, 6.4; argonin, 3.8.

Infantile Mortality and Factory Employment of Women.—At the National Conference on Infantile Mortality, held in London, in June, 1906, GEORGE REID (*Lancet*, August 18, 1906, p. 423) contrasted the infantile mortality of two districts, identical in health conditions, but with the important difference, that, in the one in which the chief industry is making pottery, women are largely employed; whereas in the other, where mining and iron-working are the principal industries, there is practically no employment for women. From figures obtained from the Registrar-General, he classified the artisan towns into three groups: (1) Those in which the proportion of employed married and widowed females between the ages of eighteen and fifty years reached or exceeded 12 per cent. of the total number of women of those ages; (2) those in which the proportion was from 6 to 12 per cent.; and (3) those in which it was below 6 per cent. In group 1, the infantile mortality was highest and in group 2 it was lowest, and this order was found to obtain constantly since 1881. Thus, in the decades 1881–1890, 1891–1900, and four-year period 1901–1904, the average yearly infantile mortality rates of group 1 were 195, 212, and 193; of group 2 were 165, 175 and 156; and of group 3 were 156, 168, and 149. The reasons for these differences are not far to seek. The factory working-woman stays at her work until confinement and returns as soon afterward as possible, leaving her child to the care of others and to be fed artificially; the home-staying woman has far lighter work up to confinement and can give her infant personal attention and its natural food.

Naphthol Preparations in Disinfection.—Although both alpha- and beta-naphthol possess very marked bactericidal power, their very slight solubility in water has made them unavailable for general use; and attempts to introduce beta-naphthol in the form of its soluble sodium compound, which is much less powerful than free naphthol, have come to naught, because through the influence of light and air the compound is converted into an insoluble inert substance. SCHNEIDER (*Ztsch. f. Hygiene u. Infectiousk.*, 1906, lii, 534) found that equal parts of beta-naphthol and dried sodium carbonate, thoroughly mixed, can be employed to advantage, the carbonate promoting the solution of the naphthol in water without forming with it a new compound. A 1 per cent. solution of this mixture proved able to kill, in ninety-six hours, dried anthrax spores which resisted the action of 5 per cent. lysol for ten days, and a slightly stronger solution (1.50 per cent.) destroyed them in seventy-two hours. Against typhoid organisms and staphylococci the mixture proved to be about twice as powerful as lysol.

Typhoid Fever from Inhaled Infected Spray.—In a village in Alsace, one hundred persons were seized with typhoid fever within a period of six months. The infection is attributed by GARCIN (*Strassburger*

med. Zeit., January, 1906, p. 36) to water from an old well, which was used solely for feeding a spraying apparatus in a spinning room. The water was not available for drinking purposes, and hence, infection could have gained access to the system only through inhalation.

Detection of Typhoid Bacilli in Milk.—An outbreak of typhoid fever in Kolozsvár has been traced by D. KONRÁD (*Centralb. j. Bakt.*, 1905, I Abt, xl, 31) to milk, the specific organism having been detected in two of thirty-three samples of milk examined. It appeared that the son of the dairyman had a mild typhoid, which did not prevent him from doing the milking and thus infecting the milk directly.

Typhoid Carriers.—According to LENTZ (*Klinisches Jahrbuch*, 1905, xiv, 475) about 4 per cent. of persons with typhoid fever become chronic carriers of the bacillus. He discovered one individual who continued to eliminate the organisms in the feces forty-two years after having had the disease. DOERR (*Centralb. j. Bakt.*, etc., Orig., 1905, xxiv, 624) quotes cases cited by others, in which the organisms were isolated from the gall-bladder seventeen and twenty years, respectively, after recovery. KÜTSCHER (*Berl. klin. Woch.*, 1905, xlii, 1620) believes that the mild cases are especially dangerous. KAYSER (*Arbeiten aus dem kaiserlichen Gesundheitsamte*, 1906, xxiv, No. 1) says that he has detected six chronic carriers who were the cause of the disease in others, and that of 205 cases of the disease occurring in Strassburg, in 1904 and 1905, twenty-eight were traceable to "healthy" carriers. KLINGER (*Ibid.*) discovered twenty-three carriers in a period of a little more than two years. All yielded the organisms in the stools and eight in the urine; and twelve of the number had no typhoid history.

The Budde Process of Preserving Milk.—R. TANNER HEWLETT (*Lancet*, 1906, 209) believes that as conditions now exist, the use of moderate amounts of preservatives is preferable to that of dirty milk, swarming with bacteria; moreover, without the use of preservatives in hot weather, much of the London milk supply would be received in condition unfit for delivery. Employing fresh milk, he tested the efficiency of the Budde process in samples to which cultures of various organisms were added, including *B. typhosus*, *B. paratyphosus*, *B. diphtheriæ*, *B. tuberculosis*, *B. anthracis* (sporing), *B. coli*, *B. dysenteriæ*, *B. subtilis*, *B. mycoides*, and *Penicillium glaucum*, and found that the non-sporing organisms were destroyed, and the spore-bearers greatly reduced in number. Hewlett states that milk properly treated by this method is unchanged in odor, appearance, taste or otherwise, and that it will keep without apparent alteration for eight to ten days in hot weather, although at the end of the process the whole of the hydrogen peroxide is decomposed and no trace of it can be detected. In ordinary milk, the reduction in the number of bacteria amounts to more than 99.9 per cent.

(The Budde process appears to yield widely differing results in the hands of different experimenters, due probably to differences in the commercial preparations of hydrogen peroxide used, and also to the degree of bacterial contamination of the milk with which the tests are made.—C. H.)

Poisoning from Foods.—An outbreak of food poisoning, involving about sixty persons, is reported by Dr. W. G. WILLOUGHBY (*Public Health*, August, 1906, p. 626). The patients were mostly adults and included every person who had eaten of a consignment of brawn, and no others. The symptoms varied in intensity according to the amount eaten, and came on a few hours after eating. They included fever, pain, vomiting, and diarrhoea. Examination of the brawn showed freedom from preservatives and the common poisons, and the presence of *B. enteritidis sporogenes*, which, from the surface, had probably grown all through the preparation. Lubenau (*Centralblatt f. Bakt.*, Orig., 1906, I Abt., xl, p. 433) reports an extensive outbreak of violent gastroenteritis due to meat dumplings. About three-fourths of the 400 inmates of a sanitarium were seized with great suddenness, there being no premonitory symptoms. Examination revealed in uneaten portions a bacillus belonging to the group of peptonizing milk bacteria. The dumplings were made of a large piece of meat which was cooked after being four days in the ice-chest and then kept two days before being finally used. The process of cooking failed to kill the spores, which later developed and elaborated toxins in large amount. A family outbreak, in which seven persons were seized with violent symptoms, after a meal of sausage, is reported by A. CAHN (*Strassburger medizin. Zeitung*, January, 1906, p. 27). The symptoms included persistent vomiting, diarrhoea with slimy stools, and fever. Part of the victims had rapid pulse and some had enlarged spleens and rose spots. On the third day all had recovered except a servant, who went through what appeared to be a genuine typhoid. In each case the stools yielded *B. paratyphosus*, type B, as did the uneaten sausage.

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All communications should be addressed to—

DR. A. O. J. KELLY, 1911 Pine Street, Philadelphia, U. S. A.

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SPECIAL ARTICLE.

**INFANTILE MORTALITY AND ITS PRINCIPAL CAUSE
—DIRTY MILK.**

BY CHARLES HARRINGTON, M.D.,

PROFESSOR OF HYGIENE IN THE HARVARD MEDICAL SCHOOL, BOSTON, MASS.

I. INFANTILE MORTALITY RATES.

ALTHOUGH it is generally well known that the mortality among infants and young children is very high, it is not commonly recognized that much of it is due to causes which are avoidable, and to one in particular which can be effectively controlled by individual and concerted effort. In this country, the annual waste of infant life fails to attract the attention to which it is entitled, largely because of indifference and ignorance on the part of the public and of public authorities to the importance of registration of vital statistics, by which alone can be measured the influence exerted by the various conditions affecting the public health. With no knowledge of the numbers of births and deaths, and of the ages at death, there obviously can be no knowledge of the rate of infantile mortality; and consequently where this is high, but unrevealed, the public mind is not disturbed. Even where vital statistics are registered and the rates of infantile mortality are therefore known, it is far from being well understood how many lost lives might easily have been saved. In some places, however, in this country and abroad, where this waste and its cause have been properly emphasized and brought home to thinking people, much has been done for its prevention, and thousands upon thousands of lives have undoubtedly been saved thereby.

The registration States of the United States are few: excepting Michigan, Indiana and the following, which recently have been added, California, Colorado, and South Dakota, they lie east of Ohio and north of Virginia—a small corner which includes New England, New York, New Jersey, Pennsylvania, Maryland, and the District of Columbia. According to the Census of 1900, the infantile mortality per thousand births in what then made up the registration area was as follows:

TABLE I.

District of Columbia	274.5	New York.	159.8
Rhode Island	197.9	Connecticut	156.8
Massachusetts	177.8	Maine	144.1
New Hampshire	172.0	Vermont	122.1
New Jersey.	167.4	Michigan	121.3

One is struck with the difference between the highest and the lowest of these figures: the former is more than twice as great as the latter; and one can but wonder what figures from every State would show and how wide would be the variation between the highest and the lowest.

As infantile mortality figures run in foreign countries, these rates, high as they are, are not extraordinary. The highest about equals that of Russia, and is not much greater than that of Austria; Rhode Island makes a better showing than Germany and Italy, and almost as good a one as Holland and Spain; New Jersey's rate is practically the same as that of France and better than that of Switzerland; Maine stands with England and Wales and better than Belgium and Denmark; Michigan, the lowest in the list, stands with Scotland. Of European countries, but three,¹ Ireland, Norway, and Sweden, have a lower rate than Michigan.

Outside the registration area, there are many cities and towns which collect their own vital statistics, and from their returns one can form some idea of what would be revealed were all of the States to adopt registration. The report of the Census of 1900 includes returns from no fewer than 106 cities and towns with infantile death-rates in excess of 175. In nine cases, the rate exceeded 300; in ten, it was between 250 and 300; in thirty-eight, it was between 200 and 250; and in forty-nine, it was between 175 and 200. These returns are shown in the following table:

¹ Ireland, average of twenty years, 1871 to 1893, 96.6; Norway, 1902, 75.08; Sweden, 1902, 107.

TABLE II.

Charleston, S. C.	419.5	Plymouth, Pa.	201.4
Savannah, Ga.	387.5	Wilmington, Del.	200.9
Mobile, Ala.	344.5	Richmond Borough, N. Y.	200.4
Key West, Fla.	311.8	Hudson, N. Y.	200.0
Biddeford, Me.	311.6	Albany, N. Y.	199.6
Atlanta, Ga.	306.0	Johnstown, Pa.	199.2
Fall River, Mass.	304.7	Reading, Pa.	198.9
Lynchburg, Va.	301.7	Brooklyn, N. Y.	197.2
Richmond, Va.	300.7	Vincennes, Ind.	197.0
Laconia, N. H.	294.6	Binghamton, N. Y.	196.9
Shreveport, La.	293.5	Sault Ste. Marie, Mich.	196.9
Jacksonville, Fla.	287.6	Jersey City, N. J.	196.4
Norfolk, Va.	284.6	Portland, Me.	195.9
Lowell, Mass.	275.5	Boston, Mass.	194.1
Washington, D. C.	274.5	Traverse City, Mich.	192.8
Petersburg, Va.	265.1	Allentown, Pa.	192.5
Nashua, N. H.	261.2	Plymouth, Mass.	192.1
Natchez, Miss.	256.3	Borough of Manhattan	190.9
Alexandria, Va.	250.0	Waterbury, Conn.	190.7
Burlington, Vt.	248.0	Paterson, N. J.	190.5
Salem, Mass.	247.7	Milwaukee, Wis.	190.2
Memphis, Tenn.	247.1	Newport, Ky.	189.8
Lawrence, Mass.	246.5	New York, N. Y.	189.4
Carlisle, Pa.	245.4	Kansas City, Mo.	186.8
Saratoga Springs, N. Y.	244.9	Cambridge, Mass.	186.5
Steelton, Pa.	244.6	Norristown, Pa.	186.4
Manchester, N. H.	238.4	Auburn, N. Y.	186.2
Owasso, Mich.	237.3	Dover, N. H.	186.0
Baltimore, Md.	235.1	Elizabeth, N. J.	185.6
Woonsocket, R. I.	233.8	Cleveland, O.	185.5
Annapolis, Md.	233.5	San Diego, Cal.	185.5
Wilmington, N. C.	232.2	New Britain, Conn.	184.9
Lansingburg, N. Y.	230.8	Easton, Pa.	184.4
Troy, N. Y.	229.5	Leavenworth, Kan.	184.4
New Orleans, La.	229.2	Mt. Carmel, Pa.	183.4
Nashville, Tenn.	228.9	Covington, Ky.	182.8
Passaic, N. J.	227.9	Newark, N. J.	182.0
Leadville, Col.	226.6	Central Falls, R. I.	181.5
New Bedford, Mass.	222.9	Pittsburg, Pa.	180.5
Augusta, Me.	219.4	Phillipsburg, Pa.	180.0
Watertown, N. Y.	219.4	Pawtucket, R. I.	179.5
Atlantic City, N. J.	215.4	Kingston, N. Y.	178.8
Raleigh, N. C.	215.4	Lawrence, Kan.	178.8
Providence, R. I.	214.9	South Bethlehem, Pa.	178.7
Altoona, Pa.	214.8	Pueblo, Col.	178.4
Phoenixville, Pa.	206.7	Hartford, Conn.	178.2
Pottstown, Pa.	204.1	Allegheny, Pa.	178.0
San Antonio, Tex.	203.9	Lima, O.	177.8
Holyoke, Mass.	203.4	Sacramento, Cal.	177.7
Poughkeepsie, N. Y.	202.6	Oskaloosa, Iowa.	177.6
Evansville, Ind.	202.4	Columbus, Ind.	177.2
Detroit, Mich.	201.2	McKeesport, Pa.	177.0
Philadelphia, Pa.	201.9	Los Angeles, Cal.	175.1

II. LEADING CAUSES.

It is unfortunate that while these figures reveal a most lamentable waste of infant life, no details are given from which one can deter-

mine its causes, and we are compelled, therefore, to have recourse to the statistics of other countries for an explanation.

In France, the average infantile death-rate for the twenty years from 1874 to 1893 was 167; in 1903 it had fallen to 137. In some cities the rate was very low, thus: Lyons, 110; Bordeaux, 112; Paris, 101. In fact, Paris had then and has now a lower rate than any large European city. In January, 1901, Balestre and Gilletta de Saint Joseph¹

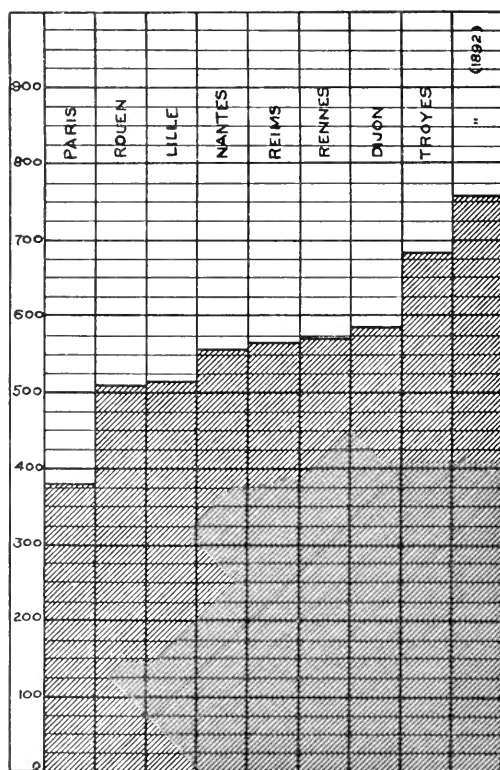


FIG. 1.—Proportion of deaths from diarrhoeal diseases per thousand in various French cities. (After Perret.)

presented to the Academy of Medicine a memoir on infantile mortality in France from 1892 to 1897, in which they showed that the chief cause of death was gastrointestinal diseases. Of each thousand deaths, 385 were due to this group, 171 to congenital debility, 147 to respiratory diseases, 50 to acute contagious diseases, 25 to tuberculosis, and 222 to all other causes. In certain cities, the diarrhoeal mortality per thousand deaths below 1 year was found to be as shown in Fig. 1.

¹ M. Perret, *Revue d'Hygiène et de Méd. Infantiles*, 1905, iv, 160.

According to Dr. E. Ausset,¹ from 1897 to 1902, of every thousand infantile deaths in the Department of the North, 359 were due to diarrhœal diseases, 169 to congenital debility, and 160 to acute respiratory diseases. The following table shows the rate of diarrhœal diseases per thousand, which obtained in certain parts of the Department.

TABLE III.

District of Dunkerque	445.08
Canton Bergues	410.61
Canton Bourbourg	485.38
Canton Wormhoudt	602.86
Canton Gravelines	404.40
The 2 Cantons of Dunkerque	465.00
District of Lille	401.26
Canton Armentières	416.66
Canton Quesnoy-sur-Deule	420.28
Canton Seclin	383.37
Canton Lannoy	398.87
Canton Roubaix	464.33
The 3 Cantons of Tourcoing	457.77
The 8 Cantons of Lille	427.83
District of Hasebrouck	395.20
Canton Merville	363.60
Canton Steenvoorde	394.44
Canton Cassel	454.66
The 2 Cantons of Bailleul	431.11
District of Valenciennes	313.92
Canton Denain	342.10
Canton Condé	337.07
Canton Bouchain	392.40

Of the European countries, Germany stands second in high infantile mortality, being surpassed only by Russia, where in some districts the rate exceeds 500 per thousand births, and in the whole country it reaches 270. The German rates for the five years 1901 to 1905 were as follows: 216, 184, 202, 204, 204. They were especially high in Bavaria, Saxony, Saxe-Altenburg, and the Reuss principalities. In 1903, for example, the rates were as follows: Bavaria, 264; Saxony, 247; Saxe-Altenburg, 266; Reuss, elder line, 247; Reuss, younger line, 250.

In 1904, in the 323 German cities and towns having populations exceeding 15,000; the rate was 202; in 1905, it was 204. In the same year, the 42 cities with populations exceeding 100,000 showed a rate of 204, and in the twelve months ended June 30, 1906, one of 198. Table IV shows the number of births, the number of deaths under one year, and the infantile death-rates of each of these cities for both periods. Of 67,633 infant deaths, 28,422 were due to diarrhœal diseases.

¹ Revue d'Hygiène et de M^d. Infantiles, 1905, iv, 433.

TABLE IV.

Place.	Number of births.		Deaths under 1 year.		Infantile death-rates.		
	1901.	July 1, 1905, to July 1, 1906.	1904.	July 1, 1905, to July 1, 1906.	1904.	July 1, 1905, to July 1, 1906.	Difference.
Aachen	4,445	4,300	898	839	202	195	- 7
Altona	1,534	4,405	833	749	184	169	-15
Barmen	4,902	4,597	681	605	139	132	- 7
Berlin	48,842	49,708	9,782	9,933	200	200	
Bochum	4,060	5,060	718	818	177	162	-15
Bremen	6,294	6,429	1,072	1,116	170	174	+ 4
Breslau	14,357	14,366	3,393	3,511	236	244	+ 8
Brunswick	3,684	3,397	672	668	182	197	+15
Cassel	3,080	3,202	502	407	163	127	-36
Charlottenburg	4,703	5,189	811	803	172	155	-17
Chemnitz	8,178	8,314	2,509	2,253	307	271	-36
Cologne	15,137	15,373	3,435	3,266	227	212	-15
Crefeld	2,769	2,752	469	390	169	142	-27
Dantzig	5,209	5,288	1,143	1,286	219	243	+24
Dortmund	6,751	7,385	1,199	1,366	178	185	+ 7
Dresden	15,153	14,297	2,914	2,735	192	191	- 1
Duisburg	4,380	7,524	845	1,137	193	151	-42
Düsseldorf	8,524	8,868	1,736	1,667	204	188	-16
Ellerfeld	5,151	4,963	796	739	155	149	- 6
Erfurt	2,765	2,960	574	597	208	202	- 6
Essen	8,061	9,494	1,325	1,498	164	158	- 6
Frankfurt a. M.	9,146	9,335	1,458	1,446	159	155	- 4
Gelsenkirchen	7,541	7,451	1,335	1,169	177	157	-20
Halle	4,982	4,985	1,141	1,175	229	236	+ 7
Hamburg	19,883	20,471	3,321	3,538	167	173	+ 6
Hannover	6,550	5,908	1,100	949	168	161	- 7
Karlsruhe	3,137	3,052	656	565	209	185	-24
Kiel	4,817	5,083	837	903	174	178	+ 4
Königsberg	5,839	6,671	1,149	1,556	197	233	+36
Leipzig	14,739	14,734	3,576	3,273	243	222	-21
Magdeburg	6,372	6,304	1,611	1,472	253	234	-19
Mannheim	5,176	5,170	1,196	1,053	231	204	-27
Munich	16,713	15,787	3,831	3,432	229	217	-12
Nuremberg	10,182	10,290	2,707	2,547	266	248	-18
Plauen	3,741	3,745	859	779	229	208	-21
Posen	5,008	5,123	1,112	1,272	222	248	+26
Rixdorf	4,530	5,547	996	1,212	220	218	- 2
Schöneberg	3,024	3,200	459	480	152	150	- 2
Stettin	7,497	7,089	1,984	1,847	265	261	- 4
Strasbourg	4,768	4,794	966	913	203	190	-13
Stuttgart	5,501	6,176	1,018	1,270	185	206	+21
Wiesbaden	2,370	2,489	347	403	146	162	+16
Total	332,525	341,295	67,966	67,637	204	198	-6

From the very admirable registration returns, it is possible to determine the diarrhoeal infantile death-rate of each city, and the percentage responsibility of the diarrhoeal diseases in the production of the high general mortality. Table V presents these figures for the twelve months ended June 30, 1906.

In Table IV, it will be noted that one city, Chemnitz, had in 1904 the unenviable distinction of an infantile death-rate of more than 300. In Table V, it will be observed that the same city leads all others in its diarrhoeal rate, 135.67, which surpasses the total infantile death-rate of Barmen (131.61) and of Cassel (127.11). Indeed, higher than the rate from all causes for England and Wales (125), for Scotland in any one of fifty years, the highest

record for that country being an average of 128 for the decade, 1891 to 1900; for Norway (average of twenty years, 1874 to 1893, 105; 1902, 75.5); for Sweden (average of twenty years, 1874 to 1893, 118; 1902, 107); Ireland (average of twenty years, 1874 to 1893, 96.6); and is almost as high as the total rate for France (1903, 137) and for all Danish cities in 1903 (137.6).

TABLE V.

Place.	Infantile death-rate.	Diarrhoeal infantile death-rate.	Percentage of infant deaths due to diarrhoeal diseases.
Aachen	195.12	78.60	40.28
Altona	169.12	38.37	22.69
Barmen	131.61	47.64	36.20
Berlin	199.83	87.99	44.03
Bochum	161.66	50.20	31.05
Bremen	173.39	73.92	42.92
Breslau	244.39	98.62	40.36
Brunswick	196.64	81.22	41.32
Cassel	127.11	31.85	25.06
Charlottenburg	154.75	54.35	35.12
Chemnitz	270.99	135.67	50.07
Cologne	212.45	93.60	44.06
Crefeld	141.71	53.42	37.69
Dantzig	243.19	109.87	45.18
Dortmund	184.96	61.75	33.38
Dresden	191.29	83.23	43.51
Duisburg	151.12	97.38	44.59
Düsseldorf	187.97	82.43	43.85
Elberfeld	148.90	50.97	34.23
Erfurt	201.69	42.90	21.27
Essen	157.78	66.67	42.26
Frankfort a. M.	154.67	53.13	34.30
Gelsenkirchen	156.89	58.11	37.04
Halle	235.71	124.77	52.94
Hamburg	172.83	70.98	41.07
Hannover	160.63	37.41	23.28
Karlsruhe	185.12	86.17	46.55
Kiel	177.65	72.99	41.08
Königsberg	233.25	113.47	48.65
Leipzig	222.14	121.49	54.69
Magdeburg	233.52	100.73	43.14
Mannheim	203.67	86.46	42.45
Munich	217.39	95.33	44.14
Nuremberg	247.53	113.80	45.97
Plauen	208.01	35.25	16.95
Posen	248.29	92.52	37.27
Rixdorf	218.49	103.66	47.44
Schöneberg	150.00	49.38	33.13
Stettin	260.54	112.28	43.09
Strasbourg	190.45	92.82	48.74
Stuttgart	205.63	74.80	36.38
Wiesbaden	161.91	49.42	30.52
Average	198.16	80.34	24.03

It will be noted, further, that three of these German cities, Chemnitz, Halle, and Leipzig, all had a diarrhoeal death-rate (135.67, 124.77, and 121.49) higher than the latest obtainable rates for all causes for the cities of Christiana (102), Lyons (110), Bordeaux (112), Amsterdam (116), Stockholm (118), Zürich (107), Geneva (117), and Basel (120).

An average diarrhoeal rate of 80.34 for the forty-two leading German cities may well cause public authorities, not alone in Germany but everywhere, to stand aghast; and especially where no records are kept, to wonder what careful and systematic registration would reveal. In these forty-two cities we find that more than two-fifths of the infantile mortality is due to diarrhoeal diseases, a considerably higher rate than obtains in France.

If we take the statistics of the same place for a series of years, we find that any considerable fluctuations in the rate from all causes are due chiefly to differences in the diarrhoeal rate alone, the rate for all other causes varying comparatively little from year to year. This is shown, for example, in the case of Berlin, in the following table:

TABLE VI.

	Births.	Deaths.	Rate.	Diarrhoea.	Per cent.	Other causes.
1900	49,834	11,762	236.02	4,743	40.32	7,019
1901	50,453	11,325	224.46	4,783	42.14	6,542
1902	49,356	8,927	180.87	2,417	27.07	6,510
1903	47,802	9,452	197.73	3,199	33.84	6,253
1904	48,885	9,783	200.12	2,846	29.09	6,937

Taking the years with the highest and lowest percentage mortality from diarrhoea, 1901 and 1902, we note that while the difference in percentage is large (15.07), the number of deaths from all other causes is practically the same; and we note, further, that, whereas the difference between the highest and lowest number of diarrhoeal deaths for the five years is 2366, the figures for deaths from all other causes have an extreme range of 766.

Let us return for a moment to the American and German returns set forth in Tables II and V.

The infantile death-rates of German cities of more than 100,000 population, during the twelve months ended June 30, 1906, which, as a rule show an improvement over those obtaining in 1904, include not one in excess of 300; our meagre returns show no fewer than nine, with one in excess of 400. The highest German rate is that of Chemnitz (270.99), which rate is surpassed by no fewer than fifteen of our registration cities and towns. Only two of the forty-two German cities in Table V show a rate higher than 250; Table II shows nineteen. Seventeen of the German cities show rates higher than 200; our returns show fifty-seven. It is true that, in making these comparisons, we are dealing not with populations of the same size, the German cities having populations in excess of 100,000 and ours being, in most cases, far smaller; but the home returns are the best available and suggest that with universal registration, our showing would be anything but satisfactory and complete. And it would seem probable, too, that complete returns

would show the same enormous influence of diarrhoeal diseases and of artificial feeding that is shown in those countries which give these matters proper consideration and study.

III. SEASONAL DISTRIBUTION.

When we study the seasonal distribution of infantile mortality, we find enormous fluctuations, the summer months showing a sudden upward curve and the autumn months an equally sharp decline.

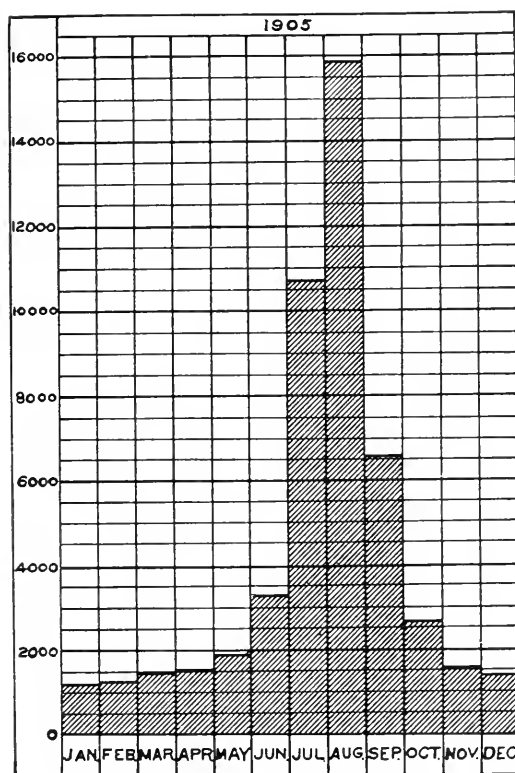


FIG. 2.—Number of deaths from diarrhoeal diseases in German cities and towns of more than 15,000 people, by months.

Thus, in 1905, in the German cities and towns with populations exceeding 15,000, there were registered 628,060 births and 128,035 deaths under one year, a rate per thousand of 203.8. The deaths from diarrhoeal diseases ranged, according to months, from 1192 in January to 15,863 in August, after which month there was a sharp fall. The rise and fall are shown in Fig. 2.

It will be observed that Fig. 2 has to do with deaths from diarrhoeal diseases alone. Fig. 3 shows the total infantile mortality

and the diarrhoeal mortality in German cities of more than 100,000 people, by months, during the twelve months, July, 1905, to June, 1906, inclusive, the double hatching indicating diarrhoeal mortality.

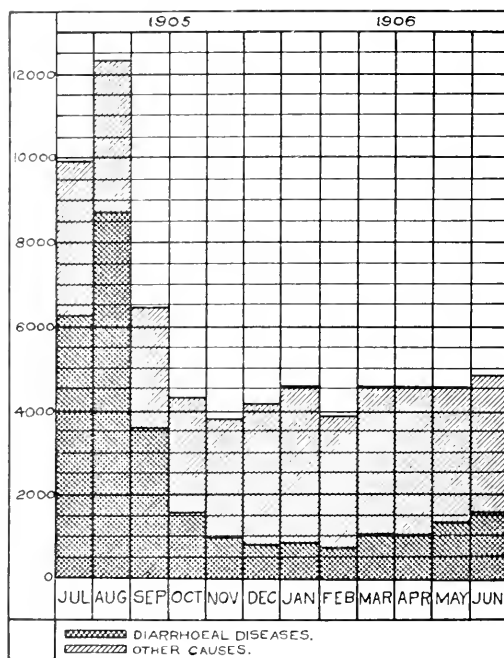


FIG. 3. Infantile mortality of all German cities of more than 100,000 population, from diarrhoeal and non-diarrhoeal diseases, by months.

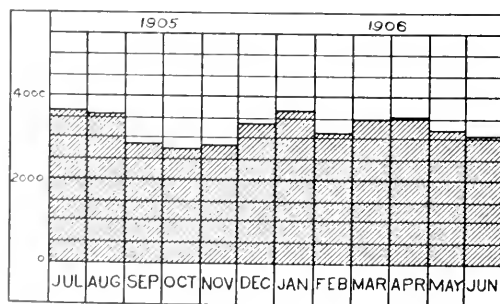


FIG. 4. Infantile mortality of all German cities of more than 100,000 population from non-diarrhoeal diseases, by months.

Still further to illustrate the comparatively constant death-rate from non-diarrhoeal causes, Fig. 4 is presented.

Referring to Table V, it will be observed that the city which showed the highest percentage mortality from diarrhoeal diseases was

Leipzig. A study of its birth-rate, its infantile death-rate, and its diarrhoeal infantile death-rate, by months, reveals the fact that, in August, the proportion of deaths to births was 570:1000, and of

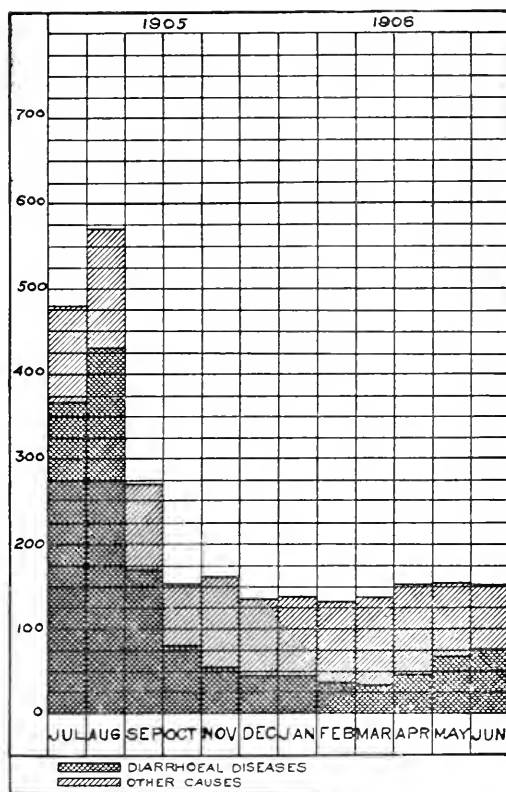


FIG. 5.—Infantile death-rates and diarrhoeal infantile death-rates of Leipzig, by months.

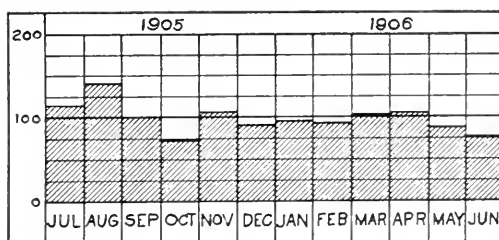


FIG. 6.—Non-diarrhoeal monthly infantile death-rates of Leipzig.

diarrhoeal deaths to births, 430:1000, whereas in February the proportions were, respectively, 131:1000 and 37:1000. The two rates by months are shown in Fig. 5.

That the non-diarrhoeal death-rates of a city are subject to no very wide fluctuations from month to month is shown graphically by Fig. 6.

From the facts and figures thus shown it might be inferred that all infants under one year of age are in great danger during the hot summer months, but this is far from being the case. Not the three summer months, but the first three months of life are the dangerous period. The report of the Registrar-General of England and Wales for 1904 shows that 49 per cent. of the infantile mortality occurs during the first three months; 20 per cent. in the second three months, and 31 per cent. in the third and fourth three months of life. In Berlin, in 1904, of 9783 infant deaths, 3175 occurred in the first month of life; 1120 in the second, and 949 in the third; thus, 5244, or 53.6 per cent. occurred in the first three months. In 1903, of 9492 deaths, 5206 (or 55.08 per cent.) occurred in the same period. The percentage for the years 1900, 1901, and 1902 were respectively 53.21, 53.47, and 55.83. And yet, in Germany, in 1905, 41.37 per cent. of the infantile mortality occurred in the months of July, August, and September, and of the 52,966 deaths which then occurred, no less than 62.8 per cent. were due to diarrhoea. How then can this seasonal distribution and the age-periods be reconciled? The answer is by no means difficult. In the first place the cause of infantile mortality that stands second to diarrhoeal diseases is set forth as congenital debility. It knows no season and its victims, whether born in January or August, die largely on their first day and in their first week or month. These deaths are naturally distributed fairly evenly throughout the year, and those from other non-diarrhoeal causes which have seasonal fluctuations tend to balance one another and maintain a fairly even line. With the vast majority of the others the chances of life and death depend upon the method of feeding, and the older an infant is when hot weather comes on, the better its chance of life; for after eight or nine months of life the possibility of going through a hot summer unharmed, however fed, is vastly greater than that of the infant born in spring or summer and fed artificially.

IV. INFLUENCE OF METHOD OF FEEDING.

In 1903, the Prussian infantile death-rates ranged from 143.82 for Barmen to 357.18 for Dantzig. In 1904, Barmen was again the lowest with 139, and for the twelve months ended June 30, 1906, was surpassed in this respect only by Cassel, which city had made great improvement over its record for 1904, 127 against 163. The enviable position of Barmen in this particular is attributed by *Liege and Sentemann*¹ chiefly to the high percentage of breast-

¹ *Centrall. f. allg. Gesundheitspflege*, 1906, xxv.

feeding, namely, 63, with 15 per cent. partially breast-fed and 22 per cent. bottle-fed. In the city of Graz, in the years 1903 and 1904, there were, according to K. Helle,¹ 170 deaths of infants from diarrhoeal disease. Of this number but 4 were breast-fed, 48 were partly breast-fed, 117 were wholly bottle-fed, and in one case the method was unknown.

In Australia the authorities are gravely concerned. According to Dr. A. J. Turner,² during the summer months, in Brisbane, more than half of the bottle-fed babies die; and Dr. Eleanor Bourne, of the Brisbane Children's Hospital, says that the majority of babies entered suffer "from the effects of improper feeding and nothing else." And Mr. P. E. Muskett, of Sydney, has asserted that of 303,070 infants dying in Australia and New Zealand in the course of 19 years prior to 1903, half might have been saved.

Dr. Arthur Newsholme,³ M. O. H. for Brighton, England, asserts that breast-fed infants contribute but one-tenth of the diarrhoeal infantile mortality, and Dr. W. J. Tyson,⁴ states that three-fourths of the 150,000 infants dying annually in Great Britain from all causes are bottle-fed. Dr. G. F. McCleary,⁵ M. O. H. for Hampstead, says that the infantile mortality dependent upon defective infant feeding is, broadly speaking, a mortality of hand-fed infants.

Dr. J. E. Sandilans,⁶ inquiring into the method of feeding of 695 infants in the Borough of Finsbury during the first nine months of life, ascertained that of the 139 that died of diarrhoeal diseases, but 16 per cent., and of those that survived, 69 per cent., were breast-fed.

In Munich, in 1903, of the 4075 infants that died, investigation showed that 3395 (or 83.3 per cent.) were artificially fed. Most striking and instructive of all, however, are the facts revealed by the very admirable statistical returns of the city of Berlin, and by the researches of Budin concerning the infantile mortality of Paris during 1898. From the former it appears that in Berlin during the five years 1900 to 1904 less than one-tenth of the infantile mortality occurred among those fed solely at the breast. The figures for each year are shown in Table VII.

TABLE VII.

Year.	No. of deaths of infants whose method of feed- ing was ascer- tained.	Number breast-fed.	Percentage solely breast-fed.	All others.
1900	9558	895	9.36	90.64
1901	9338	856	9.17	90.83
1902	7027	768	10.90	89.10
1903	7680	723	9.41	90.59
1904	7780	753	9.68	90.32

¹ Archiv. f. Hygiene, 1905, lvi, 18.² Lancet, 1906, i, 1438.³ Journal of Hygiene, April, 1906.⁴ Journal of State Medicine, September, 1904.⁵ Lancet, Aug. 18, 1906.⁶ Journal of Hygiene, January, 1906.

Budin's research concerning the infantile mortality of Paris during 1898, shows not only the enormous preponderance of deaths among the artificially fed, but its seasonal and weekly distribution (Fig. 7).

V. CLASS MORTALITY.

High infantile mortality is largely a class mortality, as is evident when one studies the returns of individual communities. It is highest, as a rule, in cities and towns whereof the population is

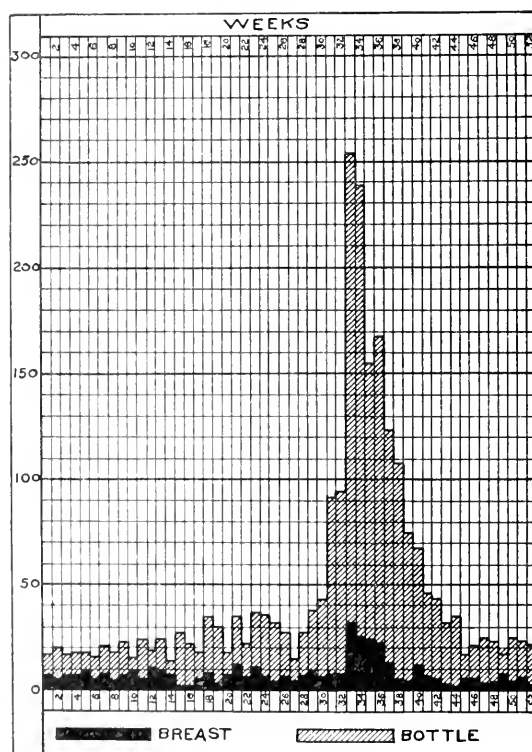


FIG. 7. Infantile mortality of Paris during 1898, by weeks, showing influence thereon of artificial feeding. (M. Perret, *Revue d'Hygiène et de Médecine Infantile*, 1905, iv, 167.)

largely ignorant and poor and where women are employed to a great extent in mills and other industrial establishments and help in this way to pay the family expenses. When pregnant, they work as long as possible up to the time of confinement, after which they return as soon as they can, leaving their offspring to the care of others and to be brought up on the bottle. In Massachusetts, for example, the cities with the highest infantile mortalities, as shown in Table II, are "mill towns;" those with the lowest are chiefly

residential in character and hold out no opportunities for the employment of married women, or their industries are of such a nature that the male wage-earners can properly maintain their wives at home as helpmeets in the true sense of the term. In other States and in foreign countries the same is commonly true; but in some of the States with large negro populations, ignorance and poverty have an equal or greater influence.

At the National Conference on Infantile Mortality held in London in June, 1906, Dr. George Reid¹ contrasted the infantile mortality of two districts, identical in health conditions, but with the important difference that, in one, women are largely employed in industrial pursuits, whereas, in the other, where mining and iron-working are the principal industries, there is practically no employment for them. From figures obtained from the Registrar-General, he classified the artisan towns into three groups:

I. Those in which the proportion of employed married and widowed females between the ages of eighteen and fifty years reached or exceeded 12 per cent. of the total number of women of those ages; II, those in which the proportion was from 6 to 12 per cent.; and III, those in which it was below 6 per cent. In group I, the infantile mortality was highest and in group III, it was lowest; and this order was found to obtain constantly since 1881. Thus, in the decades 1881 to 1890, 1891 to 1900, and four-year period 1901 to 1904, the average yearly infantile mortality rates of group I, were 195, 212, and 193; of group II, 165, 175, and 156; and of group III, were 156, 168, and 149.

Further, to illustrate the fact that we are dealing with a class mortality may be instanced the observations of K. Helle,² concerning the station of 170 infants that died of diarrhoeal diseases in Graz during 1903 and 1904. Not one belonged to a rich family, and but 9 to the well-to-do class; whereas, 49 were of the poor, and 112 of the very poor. Thus the percentage division among the four classes was respectively 0, 5.3, 28.8, and 65.9. Again, according to H. Neumann,³ in Berlin, in 1903, of 2701 infantile deaths investigated, 1792 occurred in one-room dwellings, 754 in two-room, 122 in three-room, and 43 in larger dwellings.

Illegitimacy, where common, has doubtless a very great influence generally on infantile mortality, and yet in some foreign communities where foundlings are cared for in institutions the mortality of this unfortunate class is smaller than that of the legitimate.

VI. INSANITARY DAIRYING.

Returning now to the consideration of methods of feeding, the question arises as to why the artificially-fed show so much higher

¹ *Lancet*, 1906, ii, 423.

² *Archiv. f. Hygiene*, 1906, lvi, p. 15.

³ *Deut. med. Woch.*, 1904, p. 1723.

mortality figures than the breast-fed. In the first place, each mammalian species has its own natural food supply. The natural food of the infant is human breast-milk, which differs materially in character and composition from cows' milk, which is the principal substitute therefor. It differs chiefly in the character of its proteids and to a slight extent in the nature of its fat; but by means of the well-known method of modification, cows' milk can be converted into an acceptable substitute, provided it is of proper quality. Most unfortunately, however, cows' milk is almost universally far from being of proper quality when it reaches the home of the consumer in large cities and towns, and even in the rural districts where it is produced. Indeed, it is unfit for infants' use in the great majority of cases before it leaves the premises where it is drawn, for the conditions which obtain at dairies generally in all the countries of the world, with few exceptions, are such as to insure its immediate seeding with various species of harmful bacteria; that is to say, the great majority of dairies are dirty in appointments and methods.

In this country wherever public authorities and private associations have undertaken investigations of the conditions under which the public milk supply is raised, these have been found to be often of the most revolting character, and in a number of States and cities much is being done in the line of compelling improvement. Often the objectionable conditions are evenly distributed throughout the dairy: everything is dirty—the premises as a whole, the barn, the litter, the cows, the milkers, the utensils, the water supply, and every process from the cow to the can. Where everything is dirty, and carelessness in handling is the rule, it is hardly to be expected that the product will be clean and wholesome; and when to the original handicap are added the changes due to improper conditions during long transportation and storage, frequent handling, common methods of adulteration, and lack of care at the point of final delivery, it is not a subject for wonder that when it reaches the stomach of the infant it has acquired a more or less poisonous character.

In England the conditions of dairying are, if anything, far worse than in this country, owing largely to the extent to which local authorities are bound by official red tape. The milk of London, for example, comes largely from a distance and is subject to no control whatever by the metropolitan authorities; and even where it is produced the local authorities are equally without power. According to Dodd,¹ the steps necessary to stop the introduction into London of an infected milk supply include the obtaining of an order of inspection from a justice in the district where the farm is situated, inspection by a veterinary surgeon, report to the authority, service of notice on the farmer to appear and show cause why his milk should not be excluded from sale, and condemnation by the authority. But

¹ The Problem of the Milk Supply, London, 1904.

even then the dairyman may refuse to allow inspection on pain of summons and fine of not exceeding five pounds, and in the meantime may sell his diseased cows to another, whereupon, the process must begin again as before. Moreover, inasmuch as London comprises no fewer than 29 districts, in order to exclude an infected supply from every part of the metropolis, it would be necessary for the 29 medical officers to go to the place of production and obtain 29 separate orders of inspection, 29 reports, 29 orders of notice to show cause, etc. And despite the efforts of the London County Council, in 1902, to acquire authority to exclude infected milk from the whole county of London, the bill was killed in the House of Lords on account of the opposition of certain Borough Councils. The provincial sanitary authorities are equally powerless, for although under the Infectious Diseases Prevention Act of 1890 they can exclude infected milk, they must first give notice to the County Council concerned and to the Local Government Board and must withdraw the order when the Sanitary Authority or Medical Officer of Health is satisfied that the supply is changed or the source of infection is removed, perhaps to another county. Dodd says that these orders are, generally speaking, a dead letter in most rural districts, since the local authorities will not enforce them, because they are not for the benefit of their own but of distant populations.

In this country, happily, these things are better ordered in those States which have adequate health laws. In Massachusetts, for example, the local board of health of even the smallest town has power to exclude from its markets the milk of an infected or simply dirty dairy, whether that dairy be local or far distant, and without anything more than its own order.

One may obtain a fair idea of the conditions which obtain in English dairies by reference to reports and papers presented by various health officers and other writers. Dr. Groves¹ says: "The conditions under which milk is collected in this country, especially by small dairymen, are simply too awful." Hime,² describing conditions as he found them at the farms which supplied Bradford with milk, states that he saw children's napkins washed in milk-cans, and "once I saw articles even yet more foul being washed in a milk-can which was to be used an hour later for dairy purposes." The dairies of Staffordshire appear to be far from deserving commendation. Dr. George Newman³ quotes the medical officer of Stoke-on-Trent, who stated in his report for 1900 that nearly every cow-shed inspected was overcrowded, badly lighted, and even not lighted at all, unventilated and with air so foul as to repel a visitor, dirty as to walls and floor, undrained, and containing filthy cows and accumulations of manure. Dr. Reid, M. O. H. for Staffordshire, wrote

¹ Journal of the Sanitary Institute, May, 1905, p. 229.

² British Medical Journal, 1903, ii, 1669.

³ Public Health, February, 1904, p. 258.

Newman in June, 1903: "I may mention generally that I very rarely come across a dairy farm which is satisfactory as regards the cow-sheds; most are ill-lighted, overcrowded, badly ventilated, and badly drained."

The report on the health of Manchester, for 1902, quoted by Dodd, says that the great majority of the farms of Cheshire, Derbyshire, and Staffordshire are unfit for dairying and that the cows and sheds are very dirty and many of the cows are tuberculous. Newman¹ says that in 1901, 9.2 per cent. of the cows supplying Manchester from outside the city were tuberculous, and, in 1902, 8.4 per cent. The great majority of farms visited were in a very dirty condition, and totally unfit for the production of milk. The veterinary surgeon reported that the Cheshire farms were distinctly bad, but that the farms in Derbyshire and Staffordshire were decidedly worse. Dr. G. F. McCleary,² M. O. H. for Battersea, says: "Cows' milk, as usually supplied in this country, may be, and often is, a source of grave danger. It is often grossly contaminated, the contamination taking place at the farm, in transit, in the milkshop, on the milk-round, and last, but certainly not least, in the home of the consumer."

Cumulative evidence concerning the unfitness of English dairies might be quoted almost indefinitely, did space permit, and were it necessary. The conditions obtaining in Ireland are said to be even worse. Thus, Bulstrode and Tunnicliffe³ have made a very unfavorable report, in which the filthy state of the Dublin dairies comes in for special mention.

In France and Germany, the dairy conditions rank in the main with those of England. The lack of control of French dairies is the chief impelling influence in the establishment of the numerous milk-depots and the furnishing of pasteurized milk to the poor. In Germany, the great majority of dairies are dirty and badly managed, and although many of the cities have established regulations, few enforce them.

According to A. Reinsch,⁴ in ninety-five cities with populations in excess of 40,000, eighty-one have milk regulations more or less in agreement, but concerning the presence of dirt these vary widely. Some require that there shall be no visible sediment on standing two hours, others that the amount shall not exceed 15 milligrams per liter; but in sixty-one no attention is paid to the amount of dirt which may be present.

Perhaps the worst conditions as to milk supply are those which obtain in India. According to an article in the *Lancet*,⁵ a committee of the Corporation of Calcutta, in a report on the milk supply of that city, stated that in a majority of cases "the cattle were in a

¹ Loc. cit.

² Journal of the Sanitary Institute, May, 1905, p. 225. Parliamentary Paper. (Cl. 833), Appendix IV.

³ Gesetzliche Regelung des Milchverkehrs in Deutschland, Hamburg, 1904. November 18, 1905, p. 1512.

filthy condition and were standing in offensive smelling filth inches deep; their udders were covered with muck; the cattle were packed together so closely that there was no room for them to lie down; the sheds were painfully ill-ventilated, the entrances being blocked by platforms on which the cow-men slept, and all the air-holes being closed up with mud bricks," and Mr. D. R. Bardi¹ asserts that in Bombay, where milk is extensively adulterated with polluted water, the infantile death-rate reaches the enormous height of 786.5.

In the Scandinavian countries, whose infantile death-rates are conspicuously low, even during the hotter months, far more attention is paid to dairy cleanliness and methods than anywhere else in the world, and yet with all their care there is room for much improvement, as one can learn from personal observation at first-class dairy farms and milk-distributing concerns in Denmark.

It may be asked: If infantile diarrhœas are due to milk produced, handled, or stored under improper conditions, why is it that they are so vastly more prevalent in July and August, when, at least, the cows at pasture are more likely to be clean than when housed? Milk produced under ordinary conditions is sure to contain large numbers of bacteria per cubic centimeter before the operation of milking is completed; under favoring conditions these organisms multiply enormously within a few hours; and the one favoring condition of growth is warmth. If milk is cooled at once to 45° F. and kept at about that temperature until needed for use, the original bacteria not only may not have increased materially, but may even have diminished in numbers; but at how many dairies in every hundred is milk properly cooled and to what extent is milk kept cool during long-haul transportation, retail delivery, and home storage? How many small dairymen can afford to use ice when their product yields them so small a margin of profit? How many would use it in any event unless compelled to?

Milk "cooling" in cans immersed in a tub or trough containing water, unchanged, perhaps, for days at a time, and exposed to the rays of the broiling August sun, is a common sight in the country. After collection and delivery at the railroad station, the cans may stand a long time on the platform in the sun, and then may make a long trip in a car not provided with ice. Next comes the handling by the retailer, and perhaps another period of storage in a stable; then delivery of small cans and jars, left on the customers' doorsteps; and lastly, the storage in the home, perhaps without ice—for it must be remembered that cholera infantum is largely a disease of the poor—with exposure to dust and dirt and flies. Under these very common conditions, it is then not strange that a city's milk supply is so often richer in bacteria than its sewage.

¹ Transactions of the Bombay Medical and Physical Society, vol. ix, No. 1, quoted by the *Lancet*, 1905, ii, 1853.

Far less infantile diarrhœa occurs in the country than in cities and large towns, in proportion to population, because the milk used in the country is at least comparatively fresh, while that used in the towns is in large part decidedly stale and unfit for drinking. It is hard to convince the dairyman of less than average intelligence that dirt in milk breeds disease. He will tell you that he was brought up on it, as was the entire neighborhood; he points out the living adults and children, forgetting the infant dead; he cannot believe that a mere trace of visible cow-manure can do any harm or that bacteria which are so small that billions of them may be suspended in a teaspoonful of milk, can be large enough to accomplish any results; and he thinks clean milk a fad and complains, with right, as a rule, of the meagre reward of his labors. He has, most likely, no nearby source of ice supply; he cannot buy ice out of his small profits—quite likely he would not buy it any way; and his method of cooling is, in his opinion, quite good enough. And thus it happens that the unequal seasonal distribution of infantile diarrhœa is largely a consequence of inadequate cooling and storage of milk.

VII. POISONOUS AND INFECTED MILK.

Concerning the ways in which milk becomes seeded with bacteria as its place of origin, it is hardly necessary to enlarge, for they are now too well-known to the profession and the intelligent laity; but there are certain points about dirty milk which are not yet generally understood. Not all the bacteria that gain access to milk at the farm are capable of causing injury to the consumer; in fact the great majority of the more than 200 varieties isolated produce no harmful effects. Many species shorten the commercial life of milk by causing souring and coagulation, and these have been likened by Professor Vaughan to the red lanterns used as danger signals on highways. While certain other more hardy forms are secreting or excreting toxic substances, and others of pathogenic nature are multiplying from hundreds to millions and tens of millions, the souring bacteria are manufacturing lactic acid from the milk sugar and bringing about changes in taste and consistence which render the milk non-potable. They are easily destroyed at pasteurizing temperatures which do not affect the growth and activity of the various spore-bearing species, which peptonize and produce toxins; and so in their absence the latter can continue producing changes in milk, which grows more and more stale, and more and more dangerous, without becoming sour; and so long as milk remains sweet, so long is it considered by the world in general as fit for household use.

There is still another group of bacteria commonly present, of more importance than the peptonizing species, namely, the lactic species which are associated with that most common of

all bovine diseases, garget, or mammitis, and with other similar pathological conditions, as "yellow galt." The most common and most virulent of these is the streptococcus, which finds in warm milk a most favorable culture medium for rapid multiplication. Thus, Petruschky has shown that at room temperature (68° F.) a streptococcal content of 300 per cubic centimeter may increase in twenty-four hours to one of 10,000,000; but the same milk kept at 50° F. yielded but 30,000 per cubic centimeter, or but three one-thousandths as many. Escherich and others have noted the same rapidity of multiplication. Conn states that in fresh milk the majority of bacteria are streptococci, which come from the udder, and others have shown that these organisms may be present in the ducts, even when there is no actual inflammatory process going on. Thus, Uhlmann¹ studied more than 800 sections of 35 teats of cows, goats, and sheep and found bacteria, with micrococci predominating, in every section, and most numerous in the teats from cows. Bergey² studied the milk of several cows during an entire period of lactation and concluded that once an udder becomes infected with pyogenic bacteria the infection tends to persist over several periods of lactation. In another investigation in which a large number of milk samples, drawn in sterile tubes, were examined, Bergey³ found that more than two-thirds contained bacteria, the prevailing forms of which were the pyogenic organisms, more particularly streptococci. Careful study of these organisms revealed no definite difference between them and the streptococci concerned in pathological processes in man. They were found in nearly all the samples which contained pus and in some from cows in which no inflammatory process could be discovered.

Garget being the commonest of bovine diseases, often existing without marked symptoms and only discovered by accident; and the milk of cows with no inflammatory process going on, but with infected milk ducts, often containing pyogenic organisms, one would infer that a large part of the public supply ought to yield considerable numbers of streptococci on bacteriological examination; and the inference would be correct. Bergey⁴ found them in half the samples examined from the Philadelphia supply. Rabinowitch found them in abundance in samples from Berlin, even from the model dairies. Kaiser⁵ examined 30 samples from Graz and found that all but 7 contained streptococci, either alone or associated with staphylococci and other organisms; that is to say, 76.7 per cent. were infected; and the number of streptococci present ranged from 100,000 to 100,000,000 per cubic centimeter. Eastes⁶ examined 186 samples of

¹ Inaugural Thesis, Jena, 1903.

² University of Pennsylvania Medical Bulletin, July-August, 1904.

³ Pennsylvania State Department of Agriculture, Bulletin 125, 1904.

⁴ American Medicine, April 20, 1901.

⁵ Archiv f. Hygiene, 1906, lvi, 51.

⁶ British Medical Journal, 1899, ii, 1342.

London milk and found streptococci in about the same proportion—75.2 per cent. Foulerton¹ found staphylococci in 28 per cent. and streptococci in 32 per cent. of samples of the supply of Finsbury. The worst showing is that made by Leipzig samples in the hands of Brüning;² and be it remembered that in Table V the city showing the highest percentage of infantile deaths due to diarrhoeal diseases is Leipzig. Brüning found streptococci in numbers ranging from 100 to 1,000,000 per cubic centimeter in 26 of 28 samples (93 per cent.).

The pyogenic bacteria are by no means the sole exciting causes of infantile diarrhoeas, although they appear to be very largely responsible. In addition to these and the peptonizing species are the several types of the dysentery bacillus, *Proteus vulgaris*, *Bacillus pyocyaneus*, and others. Nor are the summer diarrhoeas the only disturbances caused by streptococci and other bacteria; but these concern children of larger growth and adults.

VIII. THE REMEDY.

What is the cure for the annual waste of human life due to stale and infected market milk? The most obvious answer would be the discontinuance of cows' milk in feeding infants, but unfortunately, bad as it is, it is the only available substitute or basis for a substitute for human milk. Then why not encourage breast-feeding? It is an unfortunate fact that a very large proportion of mothers cannot, if they would, suckle their offspring, owing to their own physical defects, which are largely hereditary. Von Bunge's statistics, drawn from all parts of Europe, show that women unable to nurse are commonly daughters of alcoholics, and he states that if two generations have been alcoholic, the third will almost certainly be unable to suckle their children. The proportion of mothers defective in this respect is commonly stated to be about half, but Bunge asserts it to be not more than a quarter.

In the lower strata of society, breast-feeding is to a large extent interfered with by the economical and sociological conditions which compel married women to work in industrial establishments, and in the upper strata it is neglected on account of its interference with what are miscalled social duties. The employment of married women may or may not be necessary, but the observation of the Rt. Hon. John Burns, President of the Local Government Board, at a national conference on infantile mortality, held in June, 1906, that it tends to make loafers of the husbands and hoodlums of the children, who lose the restraining influence of a mother's constant care, is doubtless true. He asserts that infantile mortality often rises with full employment and high wages, because of greater opportunities for obtaining alcoholic drink, and falls with poor trade.

¹ Brit. Med. Jour., 1901, ii, 121.

² Jahrbuch f. Kinderheilkunde, 1905, lxii, No. 1.

"Married women's labor makes loafers, is an individual injury, a social mistake, and a commercial blunder."

In France and Italy, the advantages of breast-feeding receive governmental and commercial recognition. In France, it is a common practice in factories to post placards proclaiming the advantages of breast-feeding and offering every facility to women to nurse their infants, including special rooms, and the women are allowed leave of absence at intervals for this purpose. In Italy such a room is obligatory in every establishment employing more than fifty women. In Vienna, an association of physicians and others has been formed to encourage suckling and to instruct mothers concerning the relation of methods of feeding to infantile mortality.

It has been observed that infant mortality among the Jews is comparatively low, and the reason therefor is doubtless the fact that among that race it is regarded as disgraceful for a man to allow his wife to work in a factory and deprive her children before their birth and afterward of a mother's care.

In view of the inability plus uncompromising disinclination of a large proportion of mothers to nurse their infants, it becomes necessary to choose the best available substitute, which happens to be cows' milk. Now, cows' milk, as we have learned, is, generally speaking, a dirty substance, unsuited hygienically or esthetically to use as a human food. Fortunately, its pathogenic power can be removed or very greatly impaired by heating, for it appears on the evidence to be true that the toxic substances of stale milk are destroyed like the pathogenic organisms of infected milk in the process of pasteurization. But is pasteurization the remedy? Is it not better to start with a clean supply than to sterilize the pus and dung just before consumption? Besides, the ignorant poor will not pasteurize milk with any regularity or great care, and too much reliance should not be placed upon municipal milk stations and philanthropic distribution.

Space will not permit, nor is it necessary to enter upon, a discussion of the injurious influence of pasteurization upon the natural properties of unheated milk; nor can the question of milk stations and "gouttes de lait" be considered here, however valuable we recognize these institutions to be; and this paper will close with a plea for clean milk at the farm and proper methods of transportation, storage, and delivery.

Who is to blame for dirty milk? Those unfamiliar with the conditions will answer that it is the farmer. While it is true that the original seeding, either with the pus and streptococci of garget or with the hundreds of varieties of bacteria incidental to dusty and dirty cow-barns, cow-dung, dirty clothes, dirty hands, dirty cows, dirty utensils, and dirty methods, takes place at the farm, the real responsibility lies with the consumer and the middleman. The consumer is disinclined to pay a fair price for this valuable article

of food. Everything else may advance in price—meats, coal, sugar, gasoline, wages, oats, pearls, and theatre tickets—and the advance is met with at most some futile grumbling; but whenever a rumor goes out that milk is to cost an extra cent per quart, loud outcries are heard and always, ostensibly, on behalf of the poor. We do not see the authors of these outcries moved to pity for the poor on account of advances in the cost of flour and potatoes or in rent; the motif is milk. Now it happens that the poor are not large consumers of milk outside of the amount necessary for infant feeding, and that the small additional burden of perhaps a cent a day could go on for a long time before the whole would amount to the cost of the smallest casket or the services of the most considerate undertaker. But it is not consideration for the poor; it is an ingrained opposition to pay more for milk than was paid a quarter of a century ago. The general population regards the pure clean milk problem as a fad of theorists and of gentlemen farmers who keep cows instead of yachts. It does not know the importance of clean milk, and unfortunately is, in large part, able to point to the fact that for a month, or a year, or a boyhood it lived on a farm and milked a cow and knows all about it. The public needs proper education that clean milk is a necessity and that infant sickness and funerals can be reduced at least 40 per cent. at almost no cost in comparison. As to the middleman, it may be said that his share in promoting infantile mortality is as great as, but no greater than, that of the customer. He is to some extent a necessary evil, but he has been eliminated in some places and can be in others. Naturally, he wants as much profit as he can get; he would like to raise his price; he would like to pay the producer less. The producer must bear the burden of increased cost of grain and hay; it is for him to provide the ice, for him to provide the labor involved in maintaining general cleanliness and proper methods. Everything is put upon the producer, and unless his herd is large and his farm extensive and otherwise profitable, he cannot bear it and produce clean milk. Direct delivery to the properly enlightened customer would make the clean milk problem simple for the small producer; and so would co-operative handling, so much in vogue in the relatively most important dairying country in the world—Denmark, where the incorrigibly or deliberately dirty producer cannot dispose of his supply.

The general elimination of the middleman is, of course, not a possibility, especially in the case of large cities which are supplied from areas a hundred or hundreds of miles away. But associations satisfied with a reasonable profit, like the two large companies of Copenhagen, for example, can handle the matter with justice to all concerned. The customer must pay a fair price, the producer must receive one, and the distributing centre should make a reasonable return on its capital. If the milk of a farm where filth is the rule, or where the cows are not free from garget and other diseases and are

not regularly inspected by a competent veterinarian; where ice is not used in cooling; where dairying methods are faulty, and other objectionable conditions obtain; if the milk from such a place is declined, that of the clean dairy is not handicapped by an unfair competition.

It is said that model farms exist for the well-to-do, without whose patronage they would invariably fail; that they cannot be made to yield a profit in competition with ordinary farms. A model farm properly manned certainly cannot compete on equal terms with a filthy farm, where no attempt is made to conduct the business in a decent manner, especially if the customers are indifferent. The dirty producer can even afford to cut prices and take customers away from the other, if customers care to save a cent and make it up in pus and cow-dung. But one does not need to run a model farm in order to have clean milk. Concrete floors and walls and monitor-top barns are not absolutely essential, however satisfactory, in the production of clean milk. A clean man can keep a few healthy cows clean in a clean barn and use clean utensils and decent methods and make clean milk without increased cost, except in summer for ice; but with large herds the employment of others becomes necessary, and perhaps one or more men must give their whole time to keeping the cows, the premises, and the utensils clean. The dirty dairyman dispenses with these and thus has an unfair advantage in competition. If the product of dirty farms, large and small, were refused a market, model farms and small, clean, ordinary farms could thrive on equal terms. A large model dairy farm with an enlightened clientèle can be profitably operated even in competition with unclean farms; and this is done in many places. But they supply but small fractions of the populations in which they operate; and what is needed are clean farms everywhere, supplying profitably entire populations educated to refuse dirty milk at any price.

ORIGINAL ARTICLES.

A CLINICAL STUDY OF EIGHTY CASES OF EXOPHTHALMIC GOITRE.¹

By W. GILMAN THOMPSON, M.D.,

PROFESSOR OF MEDICINE IN THE CORNELL UNIVERSITY MEDICAL COLLEGE, NEW YORK;
PHYSICIAN TO THE PRESBYTERIAN AND BELLEVUE HOSPITALS, NEW YORK.

EXOPHTHALMIC goitre is a more complex disease than was originally supposed and there are many yet unsolved problems in connection with its varied phenomena. The modern view that it is

¹ Read at the meeting of the Association of American Physicians, Washington, D. C., May 15 and 16, 1906.

a form of toxemia, has been definitely established, but much is yet to be learned in regard to the etiology of the acute exacerbations, as well as the more chronic forms, and also in regard to its relationship with other forms of goitre and the possibility of the concurrence of one type with another, that is, of a "simple" with an acute exophthalmic form.

Few, if any, of the modern text-book descriptions give an adequate clinical picture of the acute exacerbations of Graves' disease, and important symptoms, such as the eruption, the oedema, sweating, acute cardiac dilatation, and especially the fever, are often overlooked. The present inquiry was undertaken with the object of estimating the relative frequency and importance of these symptoms.

The findings of eighty cases are included in the report. These comprise (a) hospital cases on my service and that of several colleagues in the Presbyterian and Bellevue Hospitals; (b) cases from my clinic in the Cornell Medical College Dispensary; and (c) private cases. The cases admitted to hospitals were naturally the more serious, and it is mainly among these that the febrile exacerbations were prominent. Of these, there were forty-three, which will hereafter be referred to as "the hospital series" in distinction from the remaining thirty-seven ambulatory cases.

All of the cases presented the so-called "cardinal" symptoms, namely: a goitre, muscular tremor, general nervousness, and more or less tachycardia; while exophthalmos was observed in fifty-one, an approximate ratio of one to one and one-half. The most important facts which the investigation has elicited are three: (1) The frequency of serious acute febrile exacerbations, with dilatation of the heart; (2) the very common association of these exacerbations with tonsillitis; and (3) the possibility of mistaking the highly toxemic clinical picture for such acute conditions, as malignant endocarditis or other forms of acute general septicemia.

1. *Fever.* Among the forty-three hospital cases, fourteen presented a temperature between 101° and 104° F., in seven it rose above 104° F., and in all but four it was recorded above 99° F. The temperature was distinctly of septic type, oftenest remittent but sometimes intermittent, always irregular, and occasionally remained elevated three or four degrees for several consecutive days. The duration of the fever varied from a few days to several weeks. Often it lasted for ten days or a fortnight, in one case for forty days, and in another for thirty-eight days.

2. *Tonsillitis, etc.* In the entire series of eighty cases, there were twenty in which either simple tonsillitis or quinsy was recorded (a ratio of one to four); ten more patients gave a history of repeated attacks of bronchitis, severe coughs and colds, influenza, or pneumonia. Cases with these minor infections were notably frequent among the febrile goitres, sixteen examples being noted

in the forty-three hospital cases. In many instances the tonsillitis either accompanied or shortly preceded the acute febrile toxic paroxysm of the Graves' disease. I regard this observation as of great interest in support of the theory that, in many cases at least, the cause of the acute exacerbations appears to reside in a mild intercurrent infection of the tonsils, or some portion of the respiratory tract. There is, I believe, no direct circulatory or lymphatic relationship between the tonsils and the thyroid gland, but it seems a plausible theory that patients having a mild degree of chronic exophthalmic goitre may have the gland suddenly stimulated to toxic activity by the presence in the system of the products of some mild acute infection.

3. *Malignant Endocarditis.* The fully developed goitrous toxemia very closely resembles septicemia, more particularly malignant endocarditis, so closely, in fact, as to give rise to the possibility of an error in diagnosis. The temperature, the greatly dilated over-acting heart, with a variety of murmurs, the sweating, the eruptions, the œdema, the dyspnoea, with perhaps delirium or great mental distress and nervousness, make the analogy in goitre almost complete, especially when exophthalmos does not happen to be present, and when the thyroid enlargement is not prominent. The following case forcibly illustrates the picture of acute septicemia:

A Swedish woman, twenty-nine years of age, entered the hospital with the following history and condition: She had been in good health up to six weeks previously, never having noticed any goitrous symptoms. At that time she had a severe cold and cough, became extremely nervous and restless, and complained of violent palpitation. Two weeks later she noticed that her neck was much swollen and there were marked tremor of the hands, abdominal pains, and œdema of the legs. On admission there was no exophthalmos, but there was a large bilateral soft pulsating goitre with a thrill and bruit. The circumference of the neck measured thirteen and one-half inches. The heart apex was found five inches to the left of the midsternal line, and there were loud systolic murmurs heard over the apex and the base. The pulse was most uncertain and gaseous in type. There was a leukocytosis of 20,000; sweating was active; vomiting was frequent, and the tongue dry and red. The patient complained much of abdominal pains, chiefly in the hypochondriac region on both sides. For ten days the temperature remained above 101° F., most of that time being above 103° or 104° F.

The maximum pulse-rate was 144. There was marked dyspnoea without any pulmonary lesion, and the respirations reached 44 on several occasions. Insomnia was constant, and the patient's constant jactitation, mental distress, and complaint of the excessive pulsations in the precordium and neck were distressing to witness. The legs were greatly swollen with a tense œdema; the

skin was smooth and shining; and there was an extensive erythema over the oedematous area. This condition of the legs was so serious that in connection with the fever, leukocytosis, sweating, and typical appearance of a general septic infection, I thought they might require free incision, and called upon one of the surgeons of the hospital for advice in the matter. It was, however, fortunately decided to postpone this procedure, for I became more and more convinced that the case was one of unusually acute and serious toxic Graves' disease. The subsequent history of the case and the complete cure with the use of the Rogers-Beebe serum proved the correctness of the diagnosis. It happened that in an adjoining bed was a young woman, with malignant endocarditis and general streptococcic blood infection, and, excepting that she lacked swelling of the thyroid and the thyroid patient lacked streptococci in the blood, the two cases appeared almost identical in every important respect.

The goitrous patient was so ill that I told Dr. Rogers, who saw her with me, that it was useless to give his serum to her as she was practically moribund and could not live forty-eight hours. Nevertheless, she was given ten minims hypodermically of a rabbit serum prepared from a diseased human thyroid. There was some local reaction, and a general erythema.

The next morning the patient, whose pulse had been 140, respirations 40, and temperature 104° F., appeared slightly better and a like dose was given. She promptly showed decided improvement, and within forty-eight hours of the first injection the restlessness and insomnia disappeared, the heart action became less tumultuous, the pulse fell to 108, respirations to 26, and temperature to 102° F.; there was marked improvement in the oedema, and in every respect the patient was better. She received one more serum injection, making three in all. After a week, the patient's recovery was practically assured, although a slightly increased pulse-rate and a daily rise of temperature of about 0.5 to 1° F. remained for a fortnight longer. A most striking feature of the case was the return of the dilated heart to normal dimensions, and the complete disappearance of the loud, harsh murmurs. The oedema subsided early, but a thrombus between the two heads of the gastrocnemius somewhat retarded improvement in the right leg. The goitre rapidly lessened in size, but did not completely disappear, although its pulsations ceased. The patient remained in the hospital for two months, mainly because she was naturally weak and required time for the heart to recover equilibrium, but at the end of that period she went home. I last saw her five months after the onset of her illness. I met her on the street. She was looking the picture of health and was about to return to Sweden for a summer holiday.

In a similar case, a like improvement followed the use of the serum. The patient had had a progressive goitre for a dozen years,

with marked exophthalmos. She acquired a severe tonsillitis, and suddenly the Graves' disease symptoms became so serious that recovery seemed impossible. The heart was acutely dilated. There were loud, apical, and basilar murmurs, and the throbbing pulsations all over the body were bitterly complained of. The temperature rose to 104° F. (after the tonsillitis had subsided). It is now nearly fourteen months since the serum was given and the patient appears absolutely well excepting a slight thyroid enlargement and slight prominence of the eyes. At a recent examination I could detect no heart murmur or enlargement, and the patient boasted of racing up stairs with her little boy without getting out of breath, which she could not have done at any time in the past half-dozen years. Therefore, it appears that the serum treatment is more successful in the worst type of cases, that is, those in which the system is suddenly overwhelmed with an acute toxemia.

I have never before seen patients recover who had reached the degree of toxemia outlined in the report of the two cases above cited. In the milder chronic disease the serum, as thus far prepared, appears to have a variable effect. Dr. Rogers has furnished me with a number of samples, prepared by different methods, using different classes of animals and different types of human thyroid, some diseased and some normal. In certain cases of Graves' disease of chronic type, with the milder manifestations of slight tachycardia, dyspnoea on exertion, and restlessness, with a moderate goitre and perhaps exophthalmos, these sera have not so far produced, in my hands convincing results. In several cases marked temporary reactions like the reactions of tuberculin have followed their use, but the ultimate effect on the patients has been no greater than one often sees after rest in bed and the use of the usual therapeutic measures.

The subject is so new and the opportunities for investigation arise so slowly that it would be manifestly unfair at the present time to formulate conclusions one way or the other as to the benefit of the serum in the chronic cases. Two clinical facts, however, appear established, namely, that the Rogers-Beebe serum is capable of producing very profound reaction in many patients having Graves' disease, and that the reaction appears more favorable in direct proportion to the acuteness and severity of the symptoms. That is to say, in the extremely toxic cases closely resembling acute septicemia, decided benefit may be looked for even after the patient's condition is apparently hopeless. In other words, the more highly toxic the case the more likelihood is there of relief by the antitoxic or cytolytic serum.

One more case may be cited in illustration of the fact that the septic type of Graves' disease is ill understood and often overlooked. Some years ago a patient died in the hospital with the diagnosis of acute miliary tuberculosis, a diagnosis based apparently

upon the rapid pulse and respiration, high temperature, sweating, etc., although the patient at no time presented any definite pulmonary symptoms. A casual mention is made in the history, however, that the patient had an enlarged thyroid gland, and a careful revision of the notes leaves no doubt that the case was, after all, one of acute toxic Graves' disease.

Some additional minor observations were recorded in connection with this study of the eighty cases of Graves' disease, as follows:

Sex. There were nine males and seventy-one females, an approximate ratio of one to eight.

Age. Forty-three of the patients, or more than half, were between the ages of twenty-five and forty years inclusive. The youngest were two girls, each seventeen years old. The other ages ranged as follows: Above seventeen to twenty years, eight cases; twenty-one to thirty-six, twenty-nine; thirty-one to forty, twenty-five; forty-one to fifty, twelve; and one each at fifty-one, fifty-two, fifty-three, and fifty-four years.

Family history appears to count for very little. In only one case was there apparent hereditary influence, the patient's mother having suffered from Graves' disease.

Nervous shock, fright, etc., are often assigned as a cause of exophthalmic goitre. It is more probable that such factors act by developing latent symptoms to a sufficient degree to attract attention than that they are the actual cause of the disease. One patient who experienced a severe fright, first noticed symptoms of the disease the same day. It is scarcely probable that emotional disturbances should produce so prompt an effect, unless the disease was pre-existent in at least a latent form.

In another case, the onset of the disease was attributed to the shock received by sustaining several fractures, resulting from a fall from a window. The patient was a female, twenty-three years of age, and symptoms were first noticed one month after the injury.

In a third case, the onset of symptoms was attributed to the shock of learning of the sudden serious illness of a member of the patient's family.

In none of the series, therefore, did the influence of shock appear to be a definite causative factor.

There is apparently no special order in which typical symptoms of Graves' disease appear. In many cases, tachycardia, palpitation, and extreme nervousness are first complained of. In other instances, exophthalmos, tremor, or the goitrous swelling constitute the first symptom. Patients are themselves often quite unobservant of a considerable degree of exophthalmos. Not infrequently there is an interval of several years between the appearance of such cardinal symptoms as the tremor, palpitation, or exophthalmos.

Thyroid Enlargement. The gland was more or less enlarged in all cases, in most of them moderately and bilaterally. In four-

teen cases there was a distinct preponderance of enlargement upon the right side, and in nine upon the left.

Heart. The heart was enlarged in many cases. In thirty-seven the apex extended four inches or more to the left of the midsternal line; in ten of the thirty-seven cases beyond five inches, and in three beyond six inches.

In one-half of all cases murmurs were heard. In many instances these disappeared under treatment, showing that they were due to dilatation or overaction. The maximum pulse-rate in any case was 200; in many it averaged 120.

The acute dilatation of the heart, which is a constant accompaniment of the serious febrile exacerbations, is apparently due to the toxemia and is a frequent direct cause of death.

Dyspnœa was present in one-half of all cases. The respiration rate in many cases reached 44 and in one case it became 72.

Throat Symptoms. In addition to the presence of the goitre and the accompanying disagreeable sensations of fulness and throbbing pulsation, other phenomena in the throat often are observed. Many patients complain bitterly of constant dryness of the throat and others of a choking sensation independent of the enlargement of the thyroid gland. The voice may become hoarse.

Nervous and Mental Symptoms. Prominent among a variety of nervous and mental symptoms, which are observed in different cases, are loss of memory, difficulty of mental concentration, extreme irritability of temper, fear of death, sensation of dysphagia, of suffocation, of flushing of the face and body, and of throbbing in the back of the head and neck, vertigo, twitching of the voluntary muscles during sleep, a tendency suddenly to drop objects held in the hand, or for the support of the legs suddenly to give way.

In one case, visual hallucinations were complained of, and in another, a patient, after prolonged insomnia, was afflicted with both suicidal and homicidal impulses. Being seized with an impulse to murder her three children, and fearing inability to control it, she came to the hospital for treatment.

Another patient developed acute mania and made a desperate attempt to commit suicide.

Pain over the precordium, or pseudoangina, accompanied many cases. Another frequent site of pain was the hypochondrium on either side. Abdominal cramps also were common. Insomnia was a usual accompaniment of the acute exacerbations, and often appeared to be due to the tachycardia and especially to the intolerable sensations of fulness and violent throbbing in the precordium or axilla, as well as in the thyroid gland. In the acute toxic cases patients complained more bitterly of these symptoms than of any other.

Gastrointestinal symptoms were present in about one-fourth of the eighty cases. They consisted of irregular attacks of vomiting and diarrhœa, as well as abdominal cramps, and sensations of distention and distress.

Loss of weight was recorded in about one-third of all cases, and was often considerable. For example, one patient had lost forty-seven pounds; another sixty-five pounds; and another ninety pounds. In some cases it appeared to be due to the gastrointestinal disorder, but more often to the patient's general condition.

Edema was observed in twenty-three cases of the entire series. It was usually present in the legs, but sometimes in the ankles or hands. It was often distinctly localized over the tibiæ or calves. It was most often seen in the hospital cases.

Sweating was noticed in twenty cases, most of them naturally among the acute hospital series, as an accompaniment of the fever and other symptoms of severe intoxication.

Erythema was present in ten cases, or one in eight. It was observed chiefly in the acute toxic cases, and was frequently localized, often with edema. It is interesting to note that the serum reaction was often provocative of a general erythema, but occurring as well as a local phenomenon at the site of inoculation. More or less itching or burning accompanied it.

Hemorrhage. Slight hemorrhages are occasionally associated with the disease. One patient had had epistaxis, and three others had expectorated blood-stained sputum, although the lungs appeared normal and there was no evidence of tuberculosis.

Other Symptoms. Von Graefe's sign, Stellwag's sign, and Moeblus' sign were not often mentioned in the case histories under discussion. They are of general interest only and of little diagnostic value, as they are not usually present unless other pathognomonic symptoms have become decisive.

Pregnancy, instead of increasing the nervousness and other symptoms, as might be supposed, either exerts no special influence or the patient is materially better during the period of gestation. In one of my cases there was decided improvement observed during gestation and the same condition was manifest in another woman whom I sent to the Sloane Maternity to be confined. Several patients who had repeated pregnancies during a chronic Graves' disease asserted that they were always better during gestation. Dr. Rogers advances the theory that whereas the embryonic thyroid is comparatively undeveloped, the maternal thyroid secretions may be to some extent diverted to the embryo.

One patient stated that her symptoms always became much worse during menstruation.

Many patients gave a history of amenorrhœa. In one case this condition lasted for five months.

Diabetes. The association of diabetes with Graves' disease has been occasionally reported heretofore. It was coincident in three cases of the series and one patient's father had died of diabetes.

Thymus Gland. Enlargement of the thymus gland, or a persistent thymus, has long been known sometimes to accompany exophthalmic goitre. In one case of this series a thymus gland weighing two ounces was found at autopsy in a girl twenty-three years of age. A large persistent thymus was also found in another patient, twenty-one years of age, and in a third case the thymus weighed six ounces.

Thyroid Extract. In several cases the thyroid extract had been prescribed before the patients had come under my observation, and they were uniformly made worse by it. One patient had taken 800 grains at the rate of 8 grains per diem. She came into hospital with acute toxemia and soon died.

Duration. The duration of the disease in the cases here recorded varied from six weeks to twenty-five years, but more than one-fourth had had symptoms from two to four years.

Mortality. There were eight fatal cases, or one in ten. The duration of the disease from the onset until death is interesting in showing how often the highly toxic symptoms develop early in the course of the disease; it was as follows in the eight fatal cases respectively: Five months, eleven months, one year, two, three, five, six, and ten years.

CONCLUSIONS. 1. In a large proportion of cases, sooner or later, an acute febrile toxemia develops, in which, in addition to the cardinal symptoms of goitre, tremor, tachycardia, and exophthalmos, the following symptoms appear: fever (103° to 104° F.), acute dilatation of the heart with murmurs, a gaseous pulse, dyspnea, precordial or abdominal pains, gastrointestinal disorder, oedema of the legs, sweating, and sometimes erythema.

2. The acute toxic paroxysms may last for several weeks and the clinical picture may, in many respects, closely resemble that of malignant endocarditis.

3. The cause of the sudden toxic manifestations which arise so acutely in the course of this usually chronic malady often appears to be the intercurrent of some comparatively mild infection, such as a simple tonsillitis, quinsy, influenza, bronchitis, or an attack of gastrointestinal disorder. In twenty of the eighty cases, or in one in four, there was a history of tonsillitis or quinsy, and in ten more of acute infection of the respiratory system. In most of these cases the exacerbation of Graves' disease was fairly attributable to the secondary infection. In not a few instances patients had had this same experience repeatedly.

4. The acute dilatation of the heart, which is apparently caused by the toxemia, is the cause of death in many cases.

A YEAR'S EXPERIENCE IN INTESTINAL SURGERY.¹

BY JOHN B. DEAVER, M.D.,

SURGEON-IN-CHIEF TO THE GERMAN HOSPITAL, PHILADELPHIA.

THE forty patients who form the subject of my remarks have been operated on at the German Hospital and the Children's Hospital of the Mary J. Drexel Home during 1905. The operations comprise twelve simple enteroenterostomies; eleven intestinal resections, with enteroenterostomy; one enterotomy; two colostomies; seven enterorrhaphies for various forms of fecal fistula; one suture of a typhoid perforation; one reduction by manipulation of an intussusception; eight instances in which strangulating bands or adhesions were divided; and three other (atypical) operations—a total of forty-six operations on forty patients.

There were thirteen cases of intestinal carcinoma, all in the large bowel. The cecum was diseased in four cases; the sigmoid in four; the hepatic flexure of the colon in two; and the transverse colon, the splenic flexure of the colon, and the rectum in one case each. Five of these thirteen patients died—those in whom the splenic flexure and the rectum was involved, one of those with the cecum affected, and two of those in whom the sigmoid flexure was diseased. The remaining eight patients recovered from the primary operation and were relieved temporarily; but of the four successful cases in which the patients were seen sufficiently early for a radical operation to be done, two developed symptoms of recurrence about eight months later, and were again temporarily relieved by further operation; and in the case of two others, on whom a radical operation was done, sufficient time has not elapsed since the operation to permit of their being considered in this connection.

It is true of intestinal cancer, as of all other forms of malignant disease, that the surgeon seldom sees the patients early enough to be enabled to offer them hope of radical cure. Early recognition of internal cancer is one of the desiderata of surgery. Among the thirteen patients herewith reported, only six were seen early enough to render any radical operation justifiable, and in most of these, during the past, as during former years, I have been forced to content myself with doing an enteroanastomosis. When the cecum is affected, I perform a lateral anastomosis by suture between the lower ileum and the transverse colon, and occlude the ileum by a ligature just distal to the anastomosis. It is, I believe, universally recognized as better to use the transverse rather than the ascending colon for the anastomosis, as it is more movable; and as it has long been a recognized principle of intestinal surgery to unite movable to movable, and fixed to fixed parts of the alimentary canal.

¹ At the Meeting of the American Surgical Association, Cleveland, Ohio, May 30 and 31, 1906.

When the malignant growth affects the transverse colon or the upper part of the descending colon, an ileosigmoidostomy is the palliative operation to be preferred. In one patient with carcinoma of the upper rectum, or lower sigmoid, which could not be excised, I made an anastomosis by means of the Murphy button between the bowel above and that below the constriction—a sigmoidoprecetostomy, as it might be called. I employed the button because of the difficulty of suturing the gut in this position, and also to shorten the time of the operation. But in general I much prefer to use sutures alone.

In regard to the etiology of carcinoma of the cecum, I desire to call attention to the increasing frequency with which primary carcinoma is found in the appendix. Recently we have resumed microscopic study of all the appendices removed at the German Hospital, and Dr. A. O. J. Kelly found two cases of primary carcinoma of the appendix among the first fifty thus examined—these in addition to the four cases found several years ago. It is interesting to speculate whether additional cases would not have been encountered had we continued the microscopic study.

In the first case of cecal carcinoma (Case I), occurring in a man aged seventy years, the cecal growth appears to have originated in a traumatism received some two months before admission. In another patient (Case II), a man aged thirty-three years, the appendix had been removed for symptoms of chronic inflammation less than two months before the resection of his cecum for carcinoma. Unfortunately we had not then resumed the routine examination of every appendix, and the malignant growth, which was then presumably in its early stages, was not recognized, although it was noted that the cecum was injected and thickened. The value of routine microscopic study of appendices removed at operation is thus conclusively demonstrated.

There was one patient (Case XIV), a woman, aged seventy years, with chronic intestinal obstruction due to a stricture of the sigmoid. In view of her age, Littre's operation was done—the formation of an artificial anus in the left iliac region. She was in the hospital over seven weeks after the operation, gradually gaining strength, but she died soon after returning to her home.

Thirteen patients were operated on for acute intestinal obstruction, exclusive of two cases of intussusception, to be referred to presently, and of cases of strangulated hernia, which are not considered at all in this series. In three cases of obstruction the bowel was gangrenous and necessitated resection. The first of these patients (Case XV), a woman, had also an irreducible right femoral hernia. If the hernia, when first seen, had been inflamed from injudicious attempts to reduce it, as was the case in a patient I operated on some years ago¹ for appendicitis, it might have complicated the diagnosis;

¹ See "Appendicitis, its Diagnosis and Treatment," third edition, Philadelphia, 1905, p. 429.

but since there was no doubt that the obstruction was internal, laparotomy was done. A small knuckle of ileum was found obstructed by a band, and gangrenous; this portion of the bowel, therefore, was resected, and an end-to-end anastomosis of the intestine performed. The patient made a good recovery. The second patient (Case XVI), also a woman, who had had fecal vomiting for two days, and was in an extremely poor condition when operated on, had gangrene of the ileum from adhesions to the right Fallopian tube. In this patient, also, resection and circular enterorrhaphy were performed; but she died the next day, never fully rallying from the operation. The third patient (Case XVII) was a man who developed obstruction three weeks after an operation for appendicitis complicated by diffuse peritonitis. His vitality was at a low ebb as a result of the previous peritonitis, and he succumbed soon after the operation for obstruction.

In connection with resection of the small bowel there are several questions of interest which I do not think have ever been conclusively answered. One is, whether lateral anastomosis is to be preferred to circular enterorrhaphy. For many years end-to-end anastomosis seemed to be the method of choice, the use of the Murphy button rendering the operation rapid and comparatively safe. Later, when surgeons became more expert with intestinal sutures, the end-to-end method acquired a bad reputation, being productive of strictures, and the button was thought to predispose to perforation. Accordingly, the custom arose of closing the ends of the bowel and doing a lateral anastomosis. This method also has its drawbacks, the two chief to my mind being the time consumed and the interference with peristalsis caused by the longitudinal division of the circular fibers of the intestine. The unnatural deviation of the intestinal channel is also undesirable, and the blind pouches formed at each end of the apposed segments of bowel may become clogged with stagnating fecal matter. For my own part I much prefer the end-to-end method by means of sutures alone. I think that when due care is exercised, by oversewing or by knotting the suture in transit, to prevent purse-stringing or puckering of the line of sutures, no strictures need be feared. For the inexperienced or occasional operator, probably the use of the Murphy button, with end-to-end anastomosis, is preferable, but when such mechanical aid can be dispensed with, I think there can be no doubt that it is preferable to do so.

After resection of the large bowel, on the other hand, end-to-end anastomosis is distinctly inferior to lateral anastomosis, chiefly on account of the wide extraperitoneal area exposed between the layers of the mesocolon, which renders healing uncertain and fecal extravasation probable.

The other important question in connection with intestinal resection refers, not to the method of restoring the continuity of the

intestinal canal, but to whether continuity shall be restored at the primary operation, or whether it is better first to make a fecal fistula. The choice certainly depends more upon the condition of the patient and upon the site of the resection than upon any preconceived theory as to the proper course in all patients. As far as the site of resection is concerned, the old rule still holds good, I think, that the higher up in the intestinal tract the lesion is situated the more strenuous should be our endeavor to prevent the formation of a fecal fistula. In spite of the excellent results obtained by certain surgeons, by the method of carefully collecting the discharge from the proximal coil and of periodically injecting this discharge into the distal loop of bowel, I think no surgeon would court the formation of a fecal fistula in the upper intestinal tract. There remains the difficulty, however, of determining with accuracy the location of the lesion in the intestine; for I think all are agreed that intestinal localization, notwithstanding the studies of Monks, is not yet an exact science. Accordingly, I always endeavor to restore the continuity of the intestinal canal at the primary operation, unless I am convinced that to do so would unnecessarily jeopardize the patient's chances of recovery. Being convinced, however, of the importance of intestinal toxemia as a lethal factor in many of these patients, I make it a point when the bowel is distended, to empty it thoroughly on the proximal side of the obstruction before concluding the operation.

In the patient above referred to (Case XVI), in whom resection of the gangrenous ileum was done, care was taken to empty the distended bowel, about two quarts of liquid feces being evacuated. In another patient (Case XXIII), a child, who was pulseless and blue at the time of the operation, which was done under local anesthesia with cocaine, Dr. H. C. Deaver resorted to the old-fashioned operation of enterotomy—Nélaton's operation—opening a distended coil of intestine, after relieving the only constriction to be found, and then stitching the bowel into the wound. The intestinal canal was immediately relieved of several ounces of fluid, and the boy made a satisfactory recovery. The fecal fistula was subsequently cured by an intestinal resection with end-to-end anastomosis. In still another patient (Case XXI), in whom the obstruction was found to be due to a kink in the upper jejunum, a rectal tube was passed up through the colon, and by means of manipulation of the intestines exposed through the abdominal incision, nearly two pints of liquid was evacuated from the bowel. This boy, likewise, made a satisfactory recovery. In Case XVIII, also, recovery followed gentle manipulation of the distended bowel, urging its contents downward into the contracted intestine, after an adhesion had been released.

By such means as these it is often possible to avoid the formal institution of a fecal fistula; but I venture to think that there will always remain a certain class of apparently moribund patients

in whom resort to Nélaton's operation of enterotomy will be not only justifiable, but even imperative.

There were nine patients in this series with some form of fecal fistula. A patient (Case XXVIII) with enterovaginal fistula developed this condition soon after the operation of panhysterectomy for carcinoma of the uterus. She returned about a month later to have the fecal fistula repaired. This was done by opening the abdomen, releasing the ileum where it was adherent to the vagina, about six feet from the ileocecal valve, and suturing the perforation. After this operation a vesicovaginal fistula formed, but finally closed spontaneously, rather contrary to expectation, as both fistulae were an evidence of the lack of reparative power present in this patient.

There were eight cases of external fecal fistula. In three this condition was the result of appendicitis; in two, the result of strangulated inguinal hernia; in one, the result of the operation of enterotomy; the fistula in the two remaining instances being in the sigmoid, and following some pelvic lesion in women (Cases XXIX and XXXIV). The fistulae in the sigmoid were easily repaired by suture, and recovery in both cases was uneventful. Two of the patients with fistulae following appendicitis recovered after removal of the appendix and suture of the defect in the cecum; but the third patient (Case XXX) was discharged unimproved after various unsuccessful efforts had been made permanently to close the fecal fistula. Two patients (Cases XXXI and XXXIII) had been operated on a year previously elsewhere for strangulated inguinal hernia. The bowel had been gangrenous and in each case a resection and an end-to-end anastomosis had been done. The fecal fistula, which resulted in these patients, was successfully repaired by a further resection with end-to-end anastomosis. The same procedure was successful in the patient previously operated on by enterotomy.

The treatment of fecal fistula remains one of the departments of surgery which exercise in the highest degree a surgeon's judgment, patience, and skill. A fecal fistula is sometimes established by the surgeon himself, for some purpose or other. It has been urged that when this is done the two loops of bowel should be sutured side by side into the wound, so that they lie together like the barrels of a pistol, and so that the continuity of their lumen can be ultimately restored by some form of enterotome without again opening the peritoneal cavity. In my opinion this is an injudicious course to pursue. When the surgeon desires to make a fecal fistula I think it much better merely to suture the convexity of the gut to the parietal peritoneum, and then the lumen will frequently be restored spontaneously. The more healthy the bowel is the less dangerous and troublesome will a formal operation be for its repair, and any such operation be eventually required; and the only results

to be derived from the use of the enterotome in these cases are more satisfactorily accomplished by a formal operation. In patients in whom the bowels are more or less extensively diseased, and in whom any formal operation is likely to be extensive and serious, it is, on the other hand, impossible to use the enterotome, since the afferent and efferent loops are not parallel, nor are the neighboring serous coats of the intestine in a condition to permit of ready adhesion by prolonged contact. It is such cases as these that necessitate extensive resections to procure normal serous surfaces which will render possible a plastic operation for the restoration of the continuity of the intestinal canal.

There were in this series two adults with intussusception of the ileocolic variety. In the first patient (Case XXXVI), operated upon by my assistant, Dr. Ross, the intussusception was irreducible, and an ileocolostomy was done. The patient, however, died two days later of stereoremia (?). The other patient (Case XXXVII) developed symptoms of intestinal obstruction during the course of typhoid fever, and the diagnosis of intussusception was made chiefly from the existence of tenesmus and from the mucus passed by the rectum. The operation was done so soon after the development of the symptoms that the intussusception was readily reduced by manipulation, and the patient made an uneventful recovery, the course of the typhoid fever seeming to be actually shortened by the operation.

Another patient (Case XXXIX), with typhoid fever, who presented symptoms of peritoneal involvement, was also promptly operated upon. In this case the œdematous, acutely inflamed appendix was removed, and a small perforation of the lower ileum, which was exuding fecal matter, was sutured. No irrigation was employed and drainage was established by means of a glass tube to the pelvis. Recovery was uneventful.

In one patient (Case XL), a man, aged thirty-six years, there was a history of ulcerative colitis lasting for two and one-half years. At the operation the lumen of the transverse colon was found to be entirely occluded by firm masses of feces, and the descending colon and the sigmoid flexure contained large amounts of scybalous feces. The walls of the colon throughout its extent were thickened and diseased. The cecum was opened, with the intention of making an artificial anus in the right iliac region; but the walls of the bowel were so extensively diseased that the safer course seemed to be to unite the healthy ileum to the comparatively normal sigmoid. An ileosigmoidostomy was therefore done, but the patient died four days later, and the autopsy showed the site of the anastomosis to be gangrenous, the sutures sloughing out. Possibly the formation of an artificial anus, as at first intended, would have further prolonged this patient's life; but the whole colon was found so irre-

trievably diseased postmortem that any radical cure would have been out of the question. A tabular statement of the operations is herewith appended.¹

SUMMARY OF OPERATIONS ON FORTY PATIENTS (SEVERAL PATIENTS HAD MORE THAN ONE OPERATION).

Operation,	Total,	Recovery.	Death.	Mortality, Per cent.
Colostomy	2	1	1	50.0
Enterolysis for obstruction by adhesions, etc.	8	8	0	00.0
Enterorrhaphy for fecal fistula	7	7	0	00.0
" for typhoid perforation	1	1	0	00.0
Enterotomy for obstruction	1	1	0	00.0
Ileocolostomy	6	5	1	16.6
Ileosigmoidostomy	6	3	3	50.0
Intussusception reduced	1	1	0	00.0
Laparotomy for dynamic intestinal obstruction	1	1	0	00.0
Laparotomy to release kink causing obstruction	1	1	0	00.0
Resection of small intestine, with end-to-end anastomosis	5	3	2	40.0
Resection of cecum, including portions of ileum and ascending colon	3	2	1	33.3
Resection of hepatic flexure of colon, including portion of ascending and transverse colon, with end-to-end anastomosis of colon in one case, and a lateral anastomosis of ileum to transverse colon in the other	2	2	0	00.0
Resection of sigmoid flexure and ileosigmoidostomy	1	1	0	00.0
Sigmoidoproctostomy	1	0	1	100.0
Total operations	46	37	9	17.3
Total patients	40	31	9	22.5

ACCIDENTS FOLLOWING THORACENTESIS: PNEUMOTHORAX;
SUDDEN DEATH FROM EXPLORATORY PUNCTURE.²

BY GEORGE G. SEARS, M.D.,

PROFESSOR OF CLINICAL MEDICINE, HARVARD MEDICAL SCHOOL; VISITING PHYSICIAN
TO THE BOSTON CITY HOSPITAL.

WILSON FOX, writing as late as 1891, said that "a comparison of available published cases of pleurisy treated by paracentesis with tables of the general mortality of pleurisy shows that the mortality of the operation, as practised in serous effusions, exceeds and in some instances by an enormous proportion, the worst mortality of all hospital cases," but with earlier resort to paracentesis and improved technique, due chiefly to the recognition of the necessity of

¹ A short abstract of the cases herewith referred to will be found in the Trans. Amer. Assoc., 1906.
² Reported at the meeting of the Association of American Physicians, Washington, D. C., May 1906.

strict surgical cleanliness, the results of the operation are now so uniformly satisfactory that the possibility of accident is hardly considered, and it has become a routine practice both as a diagnostic and a therapeutic measure. Accidents, however, do occur, even though nothing more than an exploratory puncture is done, which vary in severity from the pleuritic urticaria, described by Minciotti to a more or less speedy death. The greatest interest attaches to those in which albuminous expectoration, sudden death from exploratory puncture, and pneumothorax have occurred. The first has recently been discussed at length by Riesman, who gives a full bibliography of the subject. The other two alone are considered in this paper.

Sudden death after the removal of even moderate amounts of fluid is a well-recognized event, but it is not so well known that it may also follow simple exploratory puncture. Attention has been especially drawn to this possibility by Carpenter, Russell, Parkinson, Fortescue-Brickdale, Oliver, and Wilks, who report in all nine cases. A tenth recently occurred under anesthesia at St. Thomas' Hospital and was the subject of a medicolegal inquiry. Seven of these were children, and in at least eight instances a solidified lung was the cause of the ambiguous signs and had been punctured by the needle. Russell concludes from a careful study of the three cases reported by him, none of which showed any gross lesion of the brain, and from animal experimentation, that it would seem that the sudden syncopal symptoms are due to afferent impulses conveyed to the medulla along the vagus nerve, whose terminal fibers, rendered unduly sensitive by compression or inflammation, are irritated by the needle. He considers the pulmonary fibers a more likely source of the impulse than the pleural. Death may be immediate or be preceded for several days by unconsciousness and convulsions, which depend upon the cerebral anemia produced by cardiac inhibition and the extreme lowering of the blood pressure. This has been accepted as an efficient explanation in most of the cases, but syncope and possibly asphyxiation, due to hemorrhage from the wounded lung, appear at times to have taken an active part. In the following case, which occurred at the Boston City Hospital in the service of Dr. J. L. Morse, to whom I am indebted for the privilege of reporting it, it is hardly probable that the exploring needle could have reached the pulmonary branches of the vagus, as autopsy showed that the two surfaces of the pleura were separated by a considerable layer of fluid.

The patient, a man aged forty years, entered the hospital July 10, 1899, with an effusion filling the left chest to the third rib. On the day after entrance sixty-four ounces of bloody fluid was removed by aspiration. The symptoms were considerably relieved, but the temperature remained elevated and the fluid reaccumulated, so that on August 1 a second attempt at aspiration was made. The

prospect of operation apparently produced no mental perturbation (which has also been considered a possible factor), and he did not wince when the needle was introduced, but he almost immediately collapsed and became cyanotic and almost pulseless. The needle was at once withdrawn. Efforts at stimulation failed, and he became unconscious and died about fifteen hours later. There were no symptoms which suggested a possible cerebral lesion. A postmortem incision of the chest only was allowed. The left pleural cavity contained several hundred cubic centimeters of bloody fluid, and the left lung was much compressed, containing practically no air with the exception of a little in the upper lobe. The lower part of the upper lobe and the whole of the lower were covered with membrane from 1 to 2 mm. in thickness. Scattered through this fibrous covering and over the parietal pleura, which was also thickened, were numerous small gray tubercles. Careful examination of the lung failed to reveal any old tuberculous focus. The heart was normal. The kidneys showed acute glomerular nephritis.

The earliest record of pneumothorax resulting from thoracentesis, which I have been able to find, was made by Hughes in 1847. The patient was a man, thirty-four years old, who had previously suffered from hemoptysis and who developed an effusion in the right pleura. He was tapped fifteen or sixteen times in a period covering about two years. Annoyed by the trouble and expense of so much medical attendance, he performed the later operations himself. At one of the earlier times "during a sudden inspiration, for which his physicians were unprepared, he drew into the pleura a considerable quantity of air, but did not suffer from the operation more than on former occasions." The account of the method adopted in order to evacuate as much of the fluid as possible is interesting, and I quote Hughes' words: "The patient was accustomed, after the cannula was in place, to rest his body on the bed and his right hand on the floor, and to prevent the ingress of air into the pleura by making a stopcock of the finger of his left hand when the fluid became low and he wanted to inspire. He would strain, and by thus compressing the contents of the thorax the fluid would flow freely, and before the effort was discontinued, he would stop the cannula with his finger, and then breathe several times; after which another effort would be made, till at length he became tired and his breathing became troublesome, when the cannula was withdrawn." I have been able to find, since Hughes' time, in a search of the literature which cannot claim to have been exhaustive, references to about fifty cases. To these I would add a brief report of four which have occurred comparatively recently at the Boston City Hospital.

CASE I. Thomas R., aged forty-five years, alcoholic, was admitted February 10, 1905. He had complained for three months of cough, feverishness, and chills. On entrance many coarse moist

rales throughout both chests were the only abnormal signs found on physical examination, but he soon developed an effusion in the right pleura and was twice aspirated. Seven ounces of thin purulent fluid, containing streptococci, was obtained the first time and thirteen the second, the needle being introduced just outside the angle of the scapula. Shortly after the second aspiration an area of amphoric respiration and voice was found near the angle of the scapula; this gradually extended, and well-marked signs of pneumothorax developed, though succussion and the coin sound were never obtained. A week later the air was entirely absorbed and was replaced by fluid. He refused operation and after his discharge was lost sight of.

CASE II.—James S., aged thirty-two years, was admitted March 20, 1905, with a pneumonic process involving the greater portion of the right lung. The temperature returned to normal by lysis during the following five days, but two days later again rose and signs of effusion were discovered. This increased until aspiration seemed advisable and forty ounces of blood-tinged sterile serum were withdrawn. During the process the needle became accidentally detached from the aspirator and air was heard to enter the chest. In spite of much apparent relief most distinctive evidence of the presence of pneumothorax was later found, as shown by an area of tympany over the upper portion of the chest with dulness below, the tympany and dulness rapidly shifting their position with every change in the posture of the patient. No record was made of the presence of the coin sound or the succussion splash. Fluid gradually replaced the air and a month later the chest was so full that he was again tapped and fluid of the same character obtained. The following day he felt so well that he insisted upon his discharge. There was then no evidence of pneumothorax.

CASE III.—This case is reported with some reserve, as the signs before aspiration were difficult to interpret and there was some reason to doubt if there was not already a small amount of air in the chest. The patient, Patsey C., an Italian about thirty years old, was admitted February 28, 1906, with a history of an illness of two weeks' duration. The signs at the base of the right chest suggested fluid, and on March 5, largely for the sake of diagnosis, a needle was introduced just outside the angle of the scapula, but nothing was obtained. One hour later the chest was much more resonant than before and the respiratory murmur was diminished and the coin sound obtained over an area the size of the hand at the level of the lower half of the scapula in the neighborhood of the puncture. On the following day most conclusive evidence of the existence of air and fluid in the chest was found, all the typical signs of hydropneumothorax being present. He was later aspirated three times, at intervals of about two weeks. When discharged in May the heart had returned to its normal position. The lung had not fully expanded, and a deposit still persisted

at the base of the right chest. The presence of air was not shown by any physical signs. His general condition was consistent with a progressive tuberculous infection, though positive evidence was still lacking.

CASE IV.—The patient, a boy aged nineteen years, was seen through the courtesy of Dr. C. F. Withington, to whose service he was admitted April 17, 1906. He entered with pneumonia, which finally involved the whole right lung. The temperature returned to normal on April 30 and remained so for four days. It then rose once more and apparently typical signs of a complicating empyema developed. On May 8, a needle was twice introduced into the right back, each time with a negative result. On the following morning the right chest was distended and there was a tympanitic area over the front extending beyond the left edge of the sternum and outward into the axilla, where it gave place to flatness. The upper limit of flatness changed rapidly with each change in the position of the patient. The respiratory murmur and voice sounds were much diminished over the tympanitic area, but neither the coin sound nor the succussion splash was present. The left border of the heart was outside the nipple line. The patient died that afternoon, but as his condition was critical before the exploratory punctures were made, it is doubtful if they influenced the ultimate result, though death was probably hastened.

The small number of such accidents, which have been recorded, cannot represent anything like the frequency with which they occur in practice. The natural disinclination to record unsuccessful cases may partially account for it, but as the mass of literature is made up mostly of single observations, which seem to have been reported because they were unusual experiences, I am inclined to lay greater stress on failure of recognition. Ewart says that it is frequently overlooked because not looked for, and states that he has witnessed it repeatedly of late, and, though they presented no difficulties in diagnosis, the more careful examination given to patients after paracentesis, since my attention was drawn to this particular accident, may partly account for my experience in meeting three cases within a comparatively short time.

Its presence cannot fail to be discovered when increased dyspnoea, cyanosis, and all the classical signs of pneumothorax immediately follow, but it may readily be missed in the perfunctory examination often given a class of patients which excites but little interest, when it presents no symptoms at its onset and exerts no apparent influence on the course of the original disease, or when the signs are ambiguous, are late in appearing, or can only be elicited in certain positions of the patient, especially when he is too ill to be freely moved. The difficulties of diagnosis in a number of the reported cases were not inconsiderable, and it was discovered only because the patients were given a thorough examination. At times only a prob-

able diagnosis can be made, but in doubtful cases efficient aid may be furnished by the x-rays.

A great majority of the patients recover, much larger probably than the recorded cases show, if, as I believe, it is frequently overlooked. The break in the lung tissue is usually soon healed and the air is more or less rapidly absorbed. A serous effusion has in rare instances been converted into an empyema, and sudden death from suffocation, due to the rapid inrush of air, has occasionally occurred, a result which might sometimes be avoided by immediate resort to free incision of the chest wall. About a third of the reported patients have died from one cause or another, but in most of them it was extremely doubtful if the pneumothorax had contributed materially to the fatal termination.

The causes assigned for the accident have been multiple. The occurrence of pneumothorax from gaseous exhalations from the pleural fluid, which was ardently debated forty years ago, and its production *ex vacuo*, which was advocated by Weil, have historical rather than practical interest. Five cases have been reported in which the aspirating pump was accidentally reversed and the condensed air in the bottle was blown into the chest. All of these recovered, but a sixth case has recently been communicated to me by a colleague, where the child immediately died. They can scarcely represent the frequency of the accident, which is not one about which the utmost frankness can be expected. Some cases have been explained as due to suction of air, through an unguarded needle, exerted by the negative pressure within the pleural cavity, and in one of the four reported it was distinctly heard to enter in this way; but in the short time, during which this was possible, no such amount as the signs showed to be present could have accumulated. There seems reason for grave doubt if this is ever the mechanism by which an appreciable pneumothorax is produced. At all events, the occasions must be rare. In the majority of cases in which fluid was obtained, it was impossible to determine whether it was due to puncture of the lung, to a tear of the pleura bound down by adhesions, or to the rupture of cavities or emphysematous bullæ caused by the expansion of the lung. Exploratory puncture in the absence of fluid may give rise to pneumothorax or may cause an analogous accident, a subcutaneous emphysema without pneumothorax, which, I am told by my colleagues, who see more of children, is not very rare in young subjects. While a small amount of emphysema around the site of puncture has been observed a number of times, my own experience is confined to but one well-marked case, which was seen with Dr. R. C. Larrabee. The patient was a boy, four years old, who was brought to the out-patient department with signs at the base of the right chest, which led to doubt in diagnosis between solidified lung and fluid. A small aspirating needle was introduced near the angle of the scapula, but only a small

amount of blood was obtained. On removing the needle, the child, who up to this time had been unusually quiet, coughed several times; immediately a patch of emphysema appeared in the chest wall, which rapidly extended until it covered the right back from shoulder to hip. He recovered within a few days.

Accidents resulting from the reversal of the aspirating pump or the possible sucking in of air through an unguarded needle are easily prevented by greater care in technique. There seems no way of avoiding those due to puncture of a solid lung by a needle introduced solely for diagnostic purposes, but they are a warning against its too reckless use before the resources of physical examination have been exhausted. Certain precautions, however, may be taken to diminish the number of those which accompany the removal of fluid, for it is noteworthy that they occurred more frequently in the chronic cases and in those in which the effusion was purulent, than in the acute serous cases, and that in a very considerable proportion large quantities were withdrawn. The rapidity of evacuation may also be an important factor, especially when only a few hundred cubic centimeters are removed, the lung from loss of elasticity being unable to expand quickly enough to occupy the vacant space. These dangers may be partially averted by allowing the fluid to run slowly and by stopping its flow after a moderate amount has been obtained, special care being taken in chronic cases and in empyemas. Experience has shown that the removal of the last drop is an unnecessarily thorough procedure, for the evacuation of even a small quantity, by altering the intrapleural pressure, not infrequently leads to rapid absorption. Siphonage is decidedly safer when the effusion is large or has existed for a long period; safer still appears the method proposed by Forlanini, by which sterile air is introduced to replace the fluid removed.

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THE DIFFERENTIAL DIAGNOSIS OF THE DISEASES HITHERTO GROUPED TOGETHER AS RHEUMATOID ARTHRITIS, CHRONIC RHEUMATISM, ARTHRITIS DEFORMANS, ETC.¹

BY P. WM. NATHAN, M.D.,

INSTRUCTOR IN ORTHOPEDIC SURGERY IN THE NEW YORK POLYCLINIC; ORTHOPEDIC SURGEON
 TO THE WASHINGTON HEIGHTS HOSPITAL, NEW YORK.

IN my two previous papers² I endeavored to show that the various joint diseases hitherto known as rheumatoid arthritis, etc., could be classified upon a definite pathological basis. It remained to be proved whether this classification could be carried out clinically; that is, whether it would be useful in practice.

In the present paper I hope to show that these diseases have definite clinical symptoms, as well as definite pathological lesions; and that when these definite symptoms are understood the various diseases can be readily differentiated from one another clinically.

Leaving, for the moment, other considerations aside, it will be found that, clinically, all the diseases associated as rheumatoid arthritis, etc., can be divided into two great classes: (1) Those which begin acutely, with a more or less definite onset, a rise in temperature, general constitutional reaction, local signs of inflammation, followed by remission or intermission, with perhaps permanent but not progressive joint disability; and (2) those which come on insidiously, with no rise in temperature, a slowly progressive course with no intermissions, leading gradually and progressively to more or less complete joint disability. I shall speak of the first of these as the inflammatory or infectious forms, the second as the trophic forms.

¹ Read at a meeting of the Orthopedic Section of the New York Academy of Medicine.

² *AMER. JOUR. MED. SCI.*, January and April, 1906.

THE INFLAMMATORY FORMS.

Of the inflammatory forms, we can distinguish a number of sub-varieties according to the onset, and, when it is known, according to the etiology.

TYPE A. The onset and early joint symptoms are mild. The temperature is never very high, and as these cases are usually not seen very early, the temperature and initial constitutional disturbance may be overlooked. The joint symptoms are mild; there is not much pain and only moderate swelling, redness, and effusion. In these cases proper treatment leads to complete recovery. The too early use of the affected joint, however, causes more or less complete permanent disability.

TYPE B. The difference between this and the previous type seems to be one of degree rather than kind. The temperature and initial constitutional reaction are more marked, and there is greater liability to permanent joint disability under adverse circumstances. In some of these cases, the glands in the neighborhood of the affected joints are swollen. These cases have been considered a separate type and called Still's disease. It is not, however, confined to children, but occurs also in adults, and (through the courtesy of Dr. E. Libman) I have seen a case in a man associated with apex solidification. In some of the cases I have seen figuring as Still's disease the small nodular swellings were not glands at all, but were due to localized tendosynovitis or a peculiar circumscribed tumor-like connective-tissue proliferation. Remissions and exacerbations and complete intermissions are common in both the above-mentioned types of disease.

TYPE C. The onset is stormy. The temperature is high and the constitutional reaction (acute toxemia) is severe. These are the cases which have sometimes been spoken of as fulminating rheumatism, and which I consider analogous to the so-called cryptogenetic septicemias.¹ Visceral (endocardial and renal) complications are common. Usually a number of joints are red, swollen, and very painful. After a severe illness, which is usually considered an attack of rheumatism, the joints are found much deformed and stiff. These patients are prone to recurrences after complete intermissions, and either the same joints or previously normal joints are then affected. For a time after the initial attack or the recurrence the joint disability increases to a certain extent, but no new joints are involved, unless there are actual recurrences, and after a time, though the disability present is permanent, it is not progressive.

After the subsidence of the acute attack we can distinguish two distinct classes of cases within this type, according to the joint condition. In one, the capsule is found to be much thickened and

¹ See my paper in AMER. JOUR. MED. SCI., January, 1906.

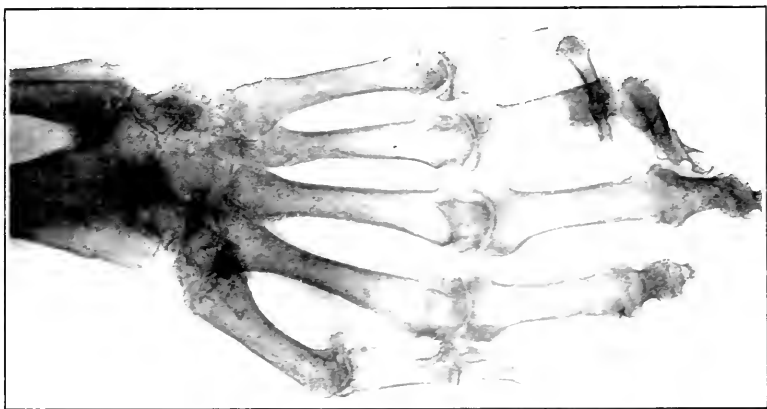


FIG. 1.—Infectious osteoarthritis, so-called arthritis ankylopoetica, showing bone spurs, bony ankylo-sis, and rarefaction.



FIG. 2.—Infectious osteoarthritis of the knee, showing complete bony ankylosis.

there is marked contraction of the soft parts, whilst the bones, when they can be palpated, are found to have retained their normal contour. In the second class, though there is occasionally effusion, there is little or no swelling of the soft parts, but the articular ends of the bones which can usually be palpated are found to have lost their normal contour. In these cases the tendency is to complete bony ankylosis. The first of these I call infectious arthritis, the second, because of the evident bone involvement, infectious osteoarthritis.

It is very important, from a pathological and clinical, as well as the therapeutic, standpoint that these two forms should be differentiated from each other. For this purpose the *x*-rays are of great advantage. If they can be used early the differential diagnosis can be made during the acute attack. In the osteoarthritic form the *x*-rays show marked bone rarefaction at a very early stage, sometimes



FIG. 3. Hand in infectious osteoarthritis, showing characteristic deformity. Complete ankylosis of the fingers and wrist.

within the first week. Later on, the *x*-rays show bone distortion, bone spurs, and bony ankylosis in osteoarthritis, whereas there is never any bone change in arthritis at any time. I reproduce the *x*-ray pictures (Figs. 1 and 2) of the hand and the knee of a case of infectious osteoarthritis, which show the bony ankylosis very distinctly. Fig. 3 is a photograph of the hands. To compare with them I show you a photograph (Fig. 4) and an *x*-ray picture (Fig. 5) of the hands of a case of infectious arthritis (synovial form). In the latter it is evident that there is no bone change, though this picture was taken some years after the attack.

The *x*-ray pictures demonstrating the infectious osteoarthritis were taken from a woman who had two distinct acute attacks; almost all the joints of the body including the spine are involved. These are the joints affected at the time of the first or second attack and those which were subsequently involved then (the ankles, the right elbow, and the left

knee) are still normal. The ultimate result of infectious osteoarthritis has been described by pathologists as arthritis ankylopoetica. As these patients may be perfectly well, aside from the permanent joint disability, and live many years after recovering from the acute infection, the specimens obtained before the days of the x-rays were usually found long years after the acute symptoms had subsided in individuals without a clinical history; hence, the name was given simply to indicate the postmortem findings. With the x-rays at our disposal and the increased knowledge of the infectious diseases



FIG. 4.—Infectious arthritis after subsidence of the acute attack, showing atrophy of the joints and deviation of the fingers (passive motion free). The radiogram in this case shows no bone lesion.

we are now enabled to distinguish the condition clinically and definitely to classify it.¹

TYPE D. In a fourth type of cases the joint affection is associated with definite and well-known infectious diseases, and the causative micro-organisms have not infrequently been found in the joints. The most common are the pneumococic, typhoid, and gonorrhœal joint diseases. These, like the infectious joint

¹ In young children the septic osteoarthritis is very likely to be suppurative, so for instance the acute epiphysitis of infancy, etc.

diseases of unknown origin, may occur as arthritides or osteoarthritis, and the differential diagnosis between the two forms can be made in the same way as the previous type. The joint disease may come on at any time during the course of the general disease or even after it has subsided. It may be monoarticular or polyarticular. The synovial forms are the most frequent, but osteoarthritis is not so uncommon as one might suppose. This applies particularly to the gonorrhœal forms, which, as is well known, some-



FIG. 5. — Radiogram of hands shown in Fig. 4. Shows total absence of bone involvement.

times run a very malignant course and result in bony ankylosis. The rapid rarefaction of the bones which occurs in the early stages of the gonorrhœal osteoarthritis can be demonstrated by x-ray pictures (Kienbock and others). The joint complications of measles, scarlet fever, and diphtheria are usually very mild, and are most likely due to the toxemia rather than to a direct invasion of the joints.

About the history of a specific infectious disease it is not possible, in the present state of our knowledge, to say positively what the

causative micro-organism is in a given case of infectious joint disease, unless the micro-organism itself can be found and demonstrated. This is true of all forms of infectious joint disease, particularly after the acute stage has subsided. The gonorrhœal forms, in which the very acute and exquisite pain, the tendency to para-articular invasion, with a very moderate rise in temperature, are characteristic, is a possible exception to this rule. It must be remembered, however, that these are not always present and that they are not absolutely pathognomonic.

Inasmuch as we are not, as yet, able to treat all the infectious diseases specifically, it seems to me more important, as far as treatment is concerned, to differentiate between infectious arthritis and infectious osteoarthritis, than to endeavor to find a distinct micro-organism for each case. Early diagnosis in osteoarthritis is very important because these cases must not be completely immobilized too long, but must receive graduated passive motion as soon as possible after the very acute symptoms have subsided. They must not, however, receive rough treatment and the patients must not be permitted to do weight-bearing for a considerable time after all symptoms have subsided. In the arthritides, because of the tendency to connective-tissue contraction, immobilization should be prolonged and passive motion and active function should not be exercised until long after all signs of joint symptoms have subsided.

The infectious joint diseases, be they synovial or osseous, may be monoarticular or polyarticular, and any or all of the joints, including the spine, may be affected. There is a rather peculiar form of infectious arthritis which almost always affects the knee-joint. This was first accurately described as a distinct affection by Schüller, who calls it arthritis villosa. The disease runs a subacute or chronic course and is characterized by an enormous proliferation of the synovial fringes. Schüller has excised the villi from the knees of a great many such cases and has found a peculiar bacterium which he considers the cause of the condition. As far as I know, no one has confirmed Schüller's findings as regards the bacteria, but the disease is common and has been recognized by a number of observers. The joint cartilages and bones in these cases are not affected.

THE TROPHIC JOINT DISEASES.

The chief clinical characteristic of the second class of joint diseases, that is, the trophic, is the insidiousness of the onset. The disease never comes on in attacks as in the inflammatory forms, and there is never elevated temperature or acute constitutional reaction. In fact, it nearly always comes on so insidiously that the patient himself is hardly able to tell when it began. Swelling, stiffness, and deformation come on gradually and progressively, and pain, though often present, is never acute or very severe.

Here, as in the infectious forms, we can distinguish two distinct groups of cases, the synovial and the osseous. The synovial forms are not nearly so characteristic or so common as the osseous forms. They come on at any age, very gradually, without much pain, and the peripheral joints are usually affected first. There is effusion and swelling of the soft parts. Some of these patients present well-marked signs of auto-intoxication, but in others I have been unable to demonstrate any other abnormality or symptom except the joint effusion and swelling. Fig. 6 shows the hands of such a case. The



FIG. 6. Hand of case of metabolic arthritis, so-called rheumatoid arthritis. The swelling is due to effusion. Passive motion is normal. Radiogram shows no bone changes.

scar on the wrist is the result of an operation undertaken a number of years ago because of a mistake in the diagnosis. An exactly similar condition occurs when there is chronic bacterial toxemia, as in bronchiectasis, pulmonary tuberculosis, etc. The condition here is one of general disturbance of the nutrition and not a direct invasion of the joint by bacteria or inflammation. I have also seen cases associated with diabetes and general arteriosclerosis. The condition, however, is more likely to cause trophic osteoarthritis. In

trophic arthritis there is never bone involvement no matter how long the disease continues.

Of the osseous form, the trophic osteoarthritis, we can distinguish a number of distinct forms clinically. First, there is the very characteristic disease which, I believe, the earlier writers, such as Adams, Smith, Heygarth, Cruveilhier, etc., considered the type of what later became known as rheumatoid arthritis or chronic rheumatism. Of the more recent writers only Baumler (arthritis deformans) and Shuchardt (arthritis nodosa) describe it as a distinct



FIG. 7.—Hand of a child with metabolic osteoarthritis (arthritis deformans, Baumler), showing nodular swelling due to thickening of the periosteum and soft parts. x-rays show rarefaction of the articular ends of the bones.

disease. Goldthwait groups it as atrophic arthritis. In the classification I use in practice I call it metabolic osteoarthritis.

The disease begins with or without some premonitory signs of tingling or formication, almost invariably in the peripheral joints; thence it proceeds very gradually but persistently from joint to joint toward the trunk, and if the patient lives long enough (which in adults is usually the case) finally involves every joint in the body, including the spine. In children the disease advances rapidly but

never acutely, and always without temperature. There is always a well-marked cachexia with general emaciation, and the disease seems to lead to complete disability and a fatal termination much more rapidly than in adults.

In adults the disease, though progressive and accompanied by a distinct cachexia, advances much more slowly or even in some cases comes to a standstill; and these patients, though more or less disabled, live many years.



FIG. 8. Hands of adult with metabolic osteoarthritis (arthritis deformans, Baumbler; atrophic arthritis, Goldthwait; rheumatoid arthritis, Garrod), showing characteristic deformation.

The joint symptoms are characteristic. At first there is a gradual swelling and the joints assume the peculiar nodular appearance shown in Fig. 7. The swelling is not due to effusion but to a peculiar thickening of the soft parts, and in adults to periosteal enlargement besides.

In adults there may be no swelling at all; when it does occur it is usually after a time, whereupon a distinct change in the contour of the

bones can always be made out. The articular ends of the bones undergo absorption from within, and in the smaller joints the absorption may be so complete that nothing at all remains of them. In this case the joints are subluxated or even completely dislocated and the hands become characteristically deformed (Fig. 8). Pain varies considerably and, as, in all joint and bone diseases, seems to be influenced by the weather. It seems to be much more severe in children than in adults.

In the more advanced stage there is nearly always a crackling noise when the joints are moved. As there is little or no tendency to connective tissue contraction and never bone ankylosis, there is no very marked limitation of passive motion. When limitation of

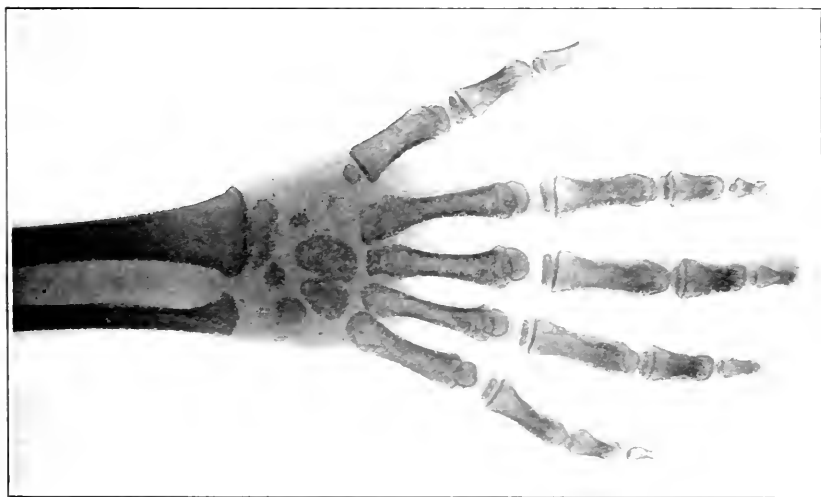


FIG. 9.—Radiogram of the hand shown in Fig. 7 showing rarefaction of the articular ends of the bones.

motion exists it is due to voluntary resistance, joint spasm, or stiffness from prolonged immobilization.

The *x*-ray pictures are very characteristic. In the early stages there is decided rarefaction of the articular ends of the bones, sometimes even of the shaft. Fig. 9 is the *x*-ray picture of the hand (Fig. 7) of a child with metabolic osteoarthritis, showing the rarefaction and the thickening of the soft parts. There is no fluid in the joints. In the later stages the absorption of the articular ends can be plainly seen, as in Fig. 10, which is a radiogram of one of the hands shown in Fig. 8. There is never bony ankylosis; on the contrary, the separation between the articular surfaces increases.

The absence of inflammatory signs in the joints, the insidiousness of the course, and the pronounced cachexia readily distinguish this

form of joint disease from the inflammatory or infectious forms. Long after the onset, when all symptoms except the deformation have disappeared, infectious osteoarthritis might be confused with it, though the ankylosis in the one and its absence in the other readily differentiate them. However, if this is not sufficient, the *x*-rays decisively clear up the diagnosis. In infectious osteoarthritis there



FIG. 10. Radiogram of one of the hands shown in Fig. 8—metabolic osteoarthritis with atrophy and absorption of the articular ends of the bones. Note the total absence of bony overgrowth.

will be found bone ankylosis and bony overgrowth. These are never present in metabolic osteoarthritis. Upon comparing Figs. 9 and 2 with Fig. 10 this difference is evident.

The mild form of osteoarthritis is often found associated with

psoriasis, though not so many joints are involved. The course, the symptoms, and the *x*-ray pictures correspond exactly with those of metabolic osteoarthritis. All the cases of joint disease associated with psoriasis which have come under my observation have been cases of metabolic osteoarthritis. Dr. Osgood, of Boston, however, informs me that he and Dr. Goldthwait have seen cases of simple metabolic arthritis associated with it. All the cases of joint diseases I have seen associated with eczema have been arthritides. It must be remembered that these joint diseases are due to general metabolic abnormalities and that all forms of trophic skin and nail lesions are common in these conditions.

A second type of osteoarthritis is the very common disease generally known as senile arthritis, or, as it occurs in the hip, as *malum coxae senilis*. This disease comes on at or past middle life, is very insidious, has very characteristic bony changes, but is not accompanied by a definite or marked cachexia. It is likely to be, but is not necessarily, monarticular. In the hip the clinical symptoms of bone disease are definite and decided; the affected extremity is shortened, the limb is adducted, and the trochanter is above Nélaton's line (bending of the neck of the femur or deepening or wandering of the acetabulum). As it occurs in the knee, elbow, or ankle there is no swelling at first, but later, as distortion goes on and the joints must perform their functions under abnormal conditions, the capsule becomes irritated mechanically and joint swelling, effusion, and proliferation of the synovial fringes supervene. Free or loose bodies are often found within the joint. In the smaller joints (phalanges) there is swelling due to periosteal proliferation—known as Heberden's nodes.

Senile osteoarthritis is readily distinguished from metabolic arthritis by the tendency to monarticular invasion, absence of pronounced cachexia, much slower progress, and the difference in the *x*-ray pictures. In senile osteoarthritis the bones are rarefied, but they never show the extreme absorption found in metabolic osteoarthritis, and the articular ends of the bones are never completely absorbed even in the smaller joints. In the larger joints the bones are bent and there are varying degrees of distortion depending upon the amount of pressure to which the bones have been subjected. The decisive characteristic in the picture of senile osteoarthritis is the pseudohypertrophic processes. They appear whenever the softened bones have been subjected to pressure or strain; and they consist of osteophytes at the insertion of the muscles and ligaments surrounding the joints, as extensions of the borders, spurs, or lipping. Fig. 11 is the radiogram of a case of senile osteoarthritis of the elbow, and shows the lipping of the head of the radius and a bony spur below the coracoid process of the ulna. These pseudohypertrophic processes are never found in metabolic osteoarthritis.

To distinguish senile from infectious osteoarthritis should rarely

present any difficulty. The differences in the onset and the course of the two diseases are usually sufficient to differentiate them. Moreover, there is never complete loss of motion in senile osteoarthritis, whilst this is the rule in infectious osteoarthritis. Bony ankylosis is common in the latter and never present in the former.

A third form of trophic osteoarthritis is that associated with organic nervous disease. Any interference with the nerve supply of the bones may cause it, but the most common causes are tabes dorsalis and syringomyelia. The joint changes are an exaggeration of those found in senile osteoarthritis. At times the disease apparently comes on suddenly; but this is due to the fact that these patients have



FIG. 11. Senile osteoarthritis of the elbow. Shows the lipping, spurs, and pseudohypertrophic processes. Besides the rarefaction, note the absence of ankylosis.

lost their pain sense and for this reason do not become aware of the joint abnormality until trauma or rough handling brings about acute joint irritation with its attendant symptoms. Not infrequently the bones are found to be very much distorted or even fractured without the patient's having been aware of his abnormality or having felt any discomfort. Not infrequently the capsule is torn and there is para-articular effusion. The joint effusion if it exists always subsides after rest.

The disease is usually monarticular and the joint affected corresponds to the nerve lesion. x-ray pictures show the rarefaction

and the distortion of the bones. There is a marked tendency to more or less complete absorption of the articular ends of the bones, and fractures or breaking off of pieces of bone, which appear as free bodies, are common. Fig. 12 is the radiogram of the hip of a man with syringomyelia. In this case the disease is almost wholly confined to the acetabulum, which is so much enlarged and deepened that the head of the femur has entirely disappeared within it and does not show in the picture. The head of the bone, which I have



FIG. 12.—Radiogram of the hip joint in a case of neurotic osteoarthritis. The acetabulum is the affected part. Notice the great increase in depth which causes the head of the femur to disappear entirely from view.

removed, aside from rarefaction and softening, shows no marked change. This acetabulum was so soft that it could be cut with a scalpel. The joint membranes were intact in this case.

The only joint disease with which neurotic osteoarthritis can be confused is senile osteoarthritis. The greater destruction not only of the bones but also of the soft parts, and the symptoms of nervous disease, readily clear up the diagnosis.

A mild form of trophic osteoarthritis also occurs in the course of certain chronic diseases in which the general nutrition suffers. Pulmonary tuberculosis and chronic bronchitis with bronchiectasis are the most common of these, and the joint disease, as well as the other signs of cachexia, are probably due to the chronic toxemia. There is rarely much joint destruction in these cases; the joints are usually swollen, not from an effusion but from periosteal proliferation of the articular ends of the bones. The *x*-rays show rarefaction even where there is apparently much thickening. These changes also occur as a result of the general nutritional disturbance caused by organic heart disease. There is rarely much disability in these cases. The characteristic feature is the so-called club-fingers.

From the analysis of the symptoms and the *x*-ray findings of the so-called rheumatoid joint diseases here undertaken it must be plain that these diseases have, as a whole, no direct connection, except that they all affect the joints. We find that there are a number of conditions having distinct general or distinct local joint symptoms. These definite clinical entities, as has been shown in a previous paper, correspond exactly to distinct pathological conditions, so that there can be no doubt of their being distinct diseases.

The term rheumatoid expresses absolutely nothing when applied to these diseases, even when it is used simply as a group name. I am, therefore, of the opinion that it would be much better to drop it entirely from the nomenclature. It is meaningless in its present use, and has been and will be, if its use is continued, a constant source of confusion.

The objection to the various classifications of the joint diseases heretofore proposed is that the names used are not specific, or specific only to a certain extent, so that not infrequently it was necessary to use the same name for two different conditions. Moreover, the names used simply express external conditions and do not indicate distinct clinical and pathological conditions.

The classification I have proposed has at least the merit of indicating distinct clinical and pathological entities by distinct names. Moreover, it does not pretend to distinguish a rather vague group of joint diseases from all others, but is applicable to joint diseases generally. The names used are not absolutely new: they are simple, they consider the general as well as the local condition, and they definitely express both the clinical and the pathological phenomena.

The complete classification as it applies to the pathology will be found in my previous paper. I illustrate its use for clinical purposes in the following table of the differential diagnosis of the diseases here dealt with. I am much indebted to Dr. L. G. Cole for the radiograms.

Name.	Onset and course.	Joint changes.	Bone changes shown by x-ray.
INFLAMMATORY OR INFECTIOUS JOINT DISEASES.			
Synovial forms.	Infectious arthritis; mild type.	Acute to subacute attacks with temperature recurrent or intermittent. Comes on in the course of an infectious disease as in gonorrhoea, etc.	Effusive thickening of the soft parts; finally atrophy of the joint appendages.
	Infectious arthritis; septic type.		
	Infectious arthritis; Still's type.		
	Gonorrhoeal arthritis.		
	Typhoid arthritis.		
Osseous forms.	Pneumococcus arthritis.	Joint condition may be permanent but no new joints are involved after the attacks cease.	No bone changes.
	Infectious villus arthritis, Schüller.		
	Infectious osteoarthritis; septic type.		
	Typhoid osteoarthritis.		
	Pneumococcus osteoarthritis.	Ankylosis.	{ Bony ankylosis and pseudohypertrophic processes, spurs, etc.
	Gonorrhoeal osteoarthritis.		
TROPIC JOINT DISEASES.			
Synovial forms.	Metabolic arthritis.	Come on insidiously without temperature. Gradually progressive, new joints affected from time to time.	Effusive thickening of the soft parts. Ultimately atrophy of joint appendages.
	Arteriosclerotic arthritis.		
	Toxic arthritis.		
Osseous forms.	Metabolic osteoarthritis.	Atrophy of joint structures.	No bone changes.
	Senile osteoarthritis.		
	Neurotic osteoarthritis.		
	Toxic osteoarthritis.		
			In metabolic osteoarthritis rarefaction and absorption of the articular ends of the bones; in the others rarefaction plus pseudohypertrophic processes. There is never ankylosis in any of the tropic osteoarthritis.

EXOPHTHALMOS IN LEUKEMIA.¹

BY JAMES B. HERRICK, M.D.,

PROFESSOR OF MEDICINE, RUSH MEDICAL COLLEGE (UNIVERSITY OF CHICAGO),
CHICAGO, ILLINOIS.

THE following case is worthy of record, not only because of the rarity of exophthalmos in leukemia, but because it will serve as a means of calling attention to the whole subject of lymphoid tumors in and around the eye, a subject not limited in its interest to the oculist, but concerning the general physician as well. I am indebted to Doctor N. Senn for the privilege of seeing the patient and reporting the case, as well as to Doctor C. Volini, under whose care the patient had been at one time, for many of the facts of the earlier history. Omitting non-essentials, the history is as follows:

P. B. was an Italian laborer, twenty-two years of age, of good habits and without discoverable hereditary or acquired taint of

¹ Read at the meeting of the Association of American Physicians, Washington, D. C., May 15 and 16, 1906.

venereal or other diseases, who had done hard work as a laborer on the railroad until December 5, 1904. On that date he had a "cold in the head," with some fever, buzzing in the ears, pains and aches over the body, and a feeling of general weakness. A few days later a swelling of the eyelids and a prominence of the eyeballs were noted. Just before Christmas, Doctor Volini saw him and found him pale, with slight fever, enlarged spleen, and distinct exophthalmos. A blood count on December 22 showed 134,000 white blood corpuscles. Condensing the results of several examinations made after December 22, I may say that the case was a typical one of acute lymphatic leukemia. From the onset of symptoms of coryza to his death, January 10, 1905, was only thirty-six days. In that time there was a gradually increasing pallor with the attendant symptoms and findings of a grave anemia, dyspnoea, palpitation, dizziness, weakness, hemic cardiac murmurs, etc. The red blood corpuscles five days before death were 1,052,000; the hemoglobin by the Fleischl instrument was 20 to 22 per cent. The white corpuscles on several countings were always above 100,000 per cubic millimeter. The count of January 5 may be taken as fairly representing the others. Number of leukocytes per c.mm., 114,000; small mononuclear, 97.84 per cent., equal 111,500; large mononuclear, 0.6 per cent., equal 684; polymorphonuclear neutrophiles, 1.36 per cent., equal 1550; mononuclear neutrophiles (myelocytes), 0.16 per cent., equal 182; polymorphonuclear eosinophiles, 0.04 per cent., equal 45; number of leukocytes counted, 2500; number of normoblasts seen, 5.

During the sixteen days he was under observation in the hospital he had a temperature that varied between 98° and 101°, with one rise to 103° F.

The spleen was palpable as a fairly firm, not especially tender mass extending a full hand's breadth below the left costal arch. The cervical, axillary, and inguinal glands were enlarged, some to the size of small hickory-nuts. There was tenderness on pressure over the sternum.

Death on January 10, 1905, was preceded by increasing dyspnoea, restlessness, and complaint of pain in the left side of the chest. A needle puncture of the ear made about this time bled for six hours, showing the hemorrhagic tendency so commonly seen in this form of leukemia, though it is noteworthy that there were no subcutaneous hemorrhages to be seen; at the autopsy, however, submucous, subserous, and visceral hemorrhages were found.

A striking feature was the early and persistent bilateral exophthalmos. There was a slight puffiness of the lids, but the prominence of the eyeball was so marked as immediately to attract attention. No other suggestions of Basedow's disease could be found, enlarged thyroid, no tremor or cardiac irritability, though the pulse was naturally accelerated (80 to 110) from the anemia.

and fever. The external ocular muscles worked perfectly, as did the iris. No tumor masses could be felt back in the orbit. There was little or no pain in the eye; vision was good. The retinal examination was negative, except for pallor. While suspecting chloroma an examination for thickening of the periosteum or for tumor masses other than the glands, especially in the temporal region was negative, nor could abnormal urinary pigment or pigmentation of the enlarged glands be made out.

Treatment consisted of strychnine, x-ray exposures every other day, and Fowler's solution in increasing doses.

The autopsy, made one hour after death by Doctor Peter Bassoe, showed: Hyperplasia of the spleen and lymph glands; enlargement of the intestinal lymph glands; lymphoid marrow in the femur; high grade of general anemia; multiple hemorrhages into the serous membranes, lymph glands, and viscera; leukemic infiltration of the lungs, kidneys, myocardium, and liver; diffuse bronchitis; atelectatic areas in the lungs; right serofibrinous pleuritis; localized fibrous adhesive pleuritis; double exophthalmos, with leukemic infiltration of the fatty tissue of both orbits.

Microscopically the findings were those commonly described as characteristic of acute lymphatic leukemia. Many organs, such as, the adrenals, kidneys, and testicles, showed the packing of vessels with lymphocytes with areas of localized lymphoid infiltration. The bones showed lymphoid transformation of the marrow. The retrobulbar orbital tissue showed general marked lymphocytic infiltration.

Exophthalmos in this case was produced by the collection of lymphoid cells in the orbit with resulting bulging of the globe of the eye. This has been reported in a few other cases of leukemia. Axenfeld,¹ in 1891, cited four cases of leukemia with orbital tumors and exophthalmos. In 1900, Hochheim² found eight cases that seemed to him beyond question leukemic in which there were symmetrical tumor formations in the lids or orbits. In one of these cases, that of Chauvel, the diagnosis of leukemia is doubtful, as Axenfeld suggests. This leaves up to 1900 seven cases of bilateral orbital leukemic tumors with resulting exophthalmos. Several cases have since been reported so that this number must be considerably increased.

All these cases have been in leukemia of the lymphatic type, that is, with glandular enlargement and lymphemia. Quite a number of instances are recorded—Hochheim cites ten—in which similar symmetrical lymphoid masses have been found in the lids or orbit (almost all showed orbital masses), in which the clinical diagnosis has been pseudoleukemia. More careful blood examinations, particularly in the way of qualitative examination of the

¹ Graefe's Archiv. f. Ophthalm., 1891, xxxvii, 102.

² Ibid, 1900, II, 347.

white corpuscles, might have resulted in placing some of these cases in the category of the lymphatic leukemias.

In what percentages of cases of lymphatic leukemia this exophthalmos occurs cannot be stated. I have seen about fifteen cases of lymphatic leukemia, eleven being of the acute type, but have never before seen exophthalmos, nor do I recall an instance in quite a number of cases of Hodgkin's disease. The condition is apparently bilateral in a large proportion of cases.

Several interesting questions come up in connection with orbital tumors in leukemia. Do they tend to prove any relationship between Hodgkin's disease and lymphatic leukemia? Does their occurrence point toward the kinship of chloroma and leukemia? Can Mikulicz's disease—symmetrical enlargement of the salivary and lacrimal glands—be in any way connected with them? What is the origin of the lymphoid masses in the orbit? Are they deposited directly from the blood or developed from pre-existing lymphoid tissue of the orbit?

Without going into the question of the nature of Hodgkin's disease, but assuming that there exists a generalized glandular enlargement that is not tuberculous and to which the name Hodgkin's disease may be applied, we may say that one of the main grounds for differentiation between chronic lymphatic leukemia and Hodgkin's disease or pseudoleukemia has been by the blood examination. Often in cases classed as Hodgkin's disease a qualitative change in the blood in the direction of a lymphocytosis can be made out; and cases of Hodgkin's disease with a sudden transformation of the blood picture to one of lymphatic leukemia are not unknown. The relationship, therefore, is apparently close. The occasional occurrence in either disease of lymphoid masses in the orbits, often in both orbits, with resulting exophthalmos, and with the histological pictures very similar, adds another bit of testimony in favor of the view that the two diseases, if not in reality identical, are at least very closely related.

Chloroma, also, closely resembles in many respects lymphatic leukemia. Distinguishing marks have been the greenish color of the masses, the tendency to periosteal involvement, and especially the formation of masses in the temporal region and the frequent occurrence of exophthalmos, often bilateral. This resemblance has not been unrecognized, and Dock,¹ in 1893, in a valuable and much-quoted paper, presented to this Association, and Dock and Warthin² in 1904 called attention to the possible close relationship of chloroma to leukemia, its general symptomatology, its blood picture, and the histological findings being strikingly alike. Orbital tumors in chloroma are common. Exophthalmos was seen thirteen

¹Chloroma and its Relations to Leukemia, AMER. JOUR. MED. SCI., 1893, cvi.

²Chloroma with Leukemia, TRANS. ASSOC. AMER. PHYS., 1904, xix.

times in Dock's seventeen cases in 1893 and was double in eleven. In eleven of eighteen cases reported since 1893 there was exophthalmos. It is present in 75 per cent. according to Rosenblath.¹ The origin of the pigment is obscure. May not the pigmentary peculiarities be in a measure accidental or non-essentials, as suggested by Meller.² May one not say that the occurrence of lymphoid masses in the orbit, usually bilateral, in both chloroma and lymphatic leukemia is more than accidental, that it points to the similar if not identical nature of the two conditions.

The relation of these orbital tumors to the disease sometimes called by the name of Mikulicz should be considered. It will be remembered that Mikulicz³ described a chronic swelling, usually bilateral and symmetrical, of the salivary and lacrymal glands, a disease *sui generis*. Now in some cases of leukemia lymphoid masses are found in the lacrymal or salivary glands, as well as in the orbit, and the question has been raised whether the leukemic masses in these situations and the somewhat similar masses in Mikulicz's disease are not very near of kin. Kümmel,⁴ however, regards the diseases as entirely different, not alone in certain histological peculiarities but in their very essence. Constitutional effects, altered blood findings, are lacking in Mikulicz's disease; nor do the tumor-like growths pass beyond the capsule of the gland. And Kümmel agrees with Mikulicz in believing that in this disease the noxa, probably microbic, enters through the excretory duct of the gland, Stenson's duct, and the origin is, in no sense, hematogenic. There is, therefore, only a superficial resemblance between leukemia and pseudoleukemia and the disease described by Mikulicz, though this resemblance is close enough to make one study a given case carefully before deciding as to its exact nature, and it has already led to some confusion in classification, cases counted by some as belonging to one group being claimed by others for the other, as for instance, the case of Delens.

While it is not the purpose of this paper to discuss the pathogenesis of these lymphoid orbital infiltrations, a word concerning this point may not be amiss. Meller,⁵ who has recently gone into the question fully, sees three possible sources: the masses of lymphoid cells may come (1) directly from the vessels; (2) from isolated conjunctival follicles that may have invaded the orbit; (3) from previously existing lymphoid tissue in the orbit. He regards the second as the most likely, supporting this view by a histological study of his specimens. Arnold's finding of small masses of lymphoid tissue in the orbit

¹ Ueber Chlorom und Leukemia, Deut. Archiv, f. klin. Med., 1902, lxxii.

² Die lymphomatösen Geschwulstbildungen in der Orbita und im Auge, von Graefe's Arch. f. Ophth., 1905, lxii.

³ Beiträge zur Chirurgie, Fest-schr. f. Billroth, Stuttgart, 1892.

⁴ Weitere Beiträge zur Lehre von der Symmetrischen Erkrankung der Thranen- und Mundspeicheldrüsen (Mikulicz), Mitt. aus d. Grenz. d. Med. u. Chir., 1897, i, 111.

⁵ Loc. cit.

would offer an easy explanation, but no general confirmation of the existence of such tissue has been forthcoming.

No definite conclusions can be drawn from a study of my specimens, but the striking regularity of the arrangement of the cells often in long rows and at times parallel to the nerve fibers speaks in favor of their origin from some pre-existing lymphatic structure.

Whatever may be the answers to these questions that I have asked in a purely suggestive way; whatever may be the pathogenesis of these orbital masses or the relation to each other of the several diseases just mentioned, the clinical fact of the occasional occurrence of exophthalmos in leukemia, pseudoleukemia, chloroma, and Mikulicz's disease should be kept in mind by both oculist and internist.

TYPHOID AND PARATYPHOID SPONDYLITIS, WITH BONY CHANGES IN THE VERTEBRÆ.¹

BY THOMAS McCRAE, M.D., M.R.C.P.,

ASSOCIATE PROFESSOR OF MEDICINE AND CLINICAL THERAPEUTICS, JOHNS HOPKINS UNIVERSITY, BALTIMORE, MARYLAND.

(From the Medical Clinic of the Johns Hopkins Hospital.)

THE usual features of typhoid spine are well recognized, and there is no intention to discuss them in detail in this paper, but the proof of definite bony changes in the vertebrae seems worthy of note, especially as in one of the instances here reported these followed infection with a paratyphoid bacillus.

CASE 1. Typhoid fever in January followed by the symptoms of typhoid spine; a typhoid relapse in July; definite bony change in the spine; recovery.

The patient was a white male, aged twenty-eight years, a lawyer, admitted to the Johns Hopkins Hospital on July 4, 1904, complaining of a stiff and painful spine. The family history was negative.

Previous History. He had always been very strong and athletic. He had the ordinary diseases of childhood: chicken-pox, measles, whooping-cough, and one attack of malarial fever some years before. There was no history of gonorrhœa or lues. He had used alcohol very moderately.

Present Illness. On January 2, 1904, he went to bed with an attack of typhoid fever of moderate severity. He was convalescent early in March, when one night he awakened suddenly with very severe pain in the back, and found that he had to lie flat and quiet in bed, as any attempt to rise caused acute pain in the lumbar region. Since then his spine has been stiff. He was able to get up in a chair

¹ At the meeting of the Association of American Physicians, Washington, D. C., 1906.

in the latter part of March and began to walk in the beginning of April. During this time his back was stiff, but not especially painful, except on movement of the lower spine. He gradually improved in general health, but the local condition grew steadily worse, and any exercise gave him a great deal of pain. At the time of admission there was almost constant pain in the lower back and down the thighs.

On admission the temperature and pulse were normal. The patient was very neurotic and quite unstrung, complaining bitterly of any movement, so that it was difficult to make a thorough examination. He was well nourished and his color was good. There was marked dermatographia at this time, and subsequently. The lungs and heart were clear. The abdomen was natural, but there was definite resistance on palpation; the muscles being held very stiffly. The spleen was not felt. There was no disturbance of the joints of the arms or legs. The spine was held almost perfectly straight and there was practically no curve in the lumbar region. There was no tenderness on pressure over the sacrum or the sciatic notch. When the patient had to sit up he pulled himself up by his hands and kept the spine as stiff as possible. He had great difficulty in standing and kept his hands on his thighs, the attitude being very characteristic. It was difficult to test any movements of the spine as he could not be induced to bend forward or backward, but lateral movements to the right seemed less than to the left. Stooping was done with a stiff spine, and on standing up the patient "climbed up his legs." The Widal reaction was well marked on the day after admission.

In the two or three days after admission the patient suffered a great deal, was very restless, and cried out frequently with pain. At times he would complain of severe spasms in the muscles of the back. He was given 4 milligrams of tuberculin, but there was no reaction. On July 9, a jacket was put on, but this seemed to make the condition worse, and large doses of sedatives did not seem to have any effect on the pain. On July 10, the temperature, normal since admission, rose to 102°, and the patient seemed dull and drowsy. The pain became more severe and there was marked rigidity of the muscles of the back. The knee-jerks could not be obtained. The blood count showed, red cells 4,220,000; leukocytes, 5000; and hemoglobin, 70 per cent. The fever continued, although rather irregular, varying from normal to 104° between July 10, and 16. On July 15, rose spots were noted, but the spleen could not be felt. After July 16, the temperature became more regularly elevated, between 103° and 104° for some days, and fever continued for a total of eighteen days. The patient became dull and drowsy, the tongue was furred and the lips dry. The lungs and heart were clear throughout. The patient usually lay with the knees drawn up, and there were frequent spasmodic movements of the abdominal

muscles. The area of splenic dulness was increased, but the spleen was not felt, any palpation being difficult on account of the condition of the abdominal walls. There was slight prominence of the spinous process of the second, third, and fourth lumbar vertebræ, on each side of which there was some fulness. Over these areas the patient constantly complained of pain. The lumbar muscles were very rigid. There was no superficial redness or fluctuation. By July 18, the ninth day of fever, the patient was rather more comfortable, the severe pain having left, and being replaced by a dull ache. The tongue was still coated. The abdomen was softer; there were some rose spots, and the splenic dulness was still increased. The leukocytes were 10,400. On July 22 the patient was very dull and apathetic, making no complaint of pain, and there was much less tenderness in the lumbar regions. There was still some fulness noted to the left of the lumbar spine. By July 29, the temperature was normal, and the patient looked as if he had been through a long illness. The movements of the upper spine seemed freer, and there was little complaint of pain. Percussion over the spine did not cause pain, and spasm of the back muscles was much less marked. There was still slight fulness to the left of the third and fourth lumbar vertebræ. By August 15 the patient could sit up in bed. He soon got about on crutches, but had difficulty in walking. He improved rapidly and was discharged on September 8. There was no local deformity or tenderness. The patient would not make the attempt to bend forward or back, but there was slight lateral movement. When the patient stooped he did it by "climbing down his thighs" with the spine held rigidly, and flexion at the hip and knee.

A blood culture during the time of fever was negative. The urine varied from 1006 to 1022 in specific gravity, showed a trace of albumin on several occasions, but no casts were found; it gave a positive diazo reaction after the onset of fever.

The radiogram, taken by Dr. Baetjer on July 5, showed on the right side, between the second and third lumbar vertebræ, a definite deposit of bone filling in the intervertebral space. This was apparently deposited in the lateral ligament, and formed a bony union between the two vertebræ. The process was localized to this one area, and the spine elsewhere was normal.

The patient made a rapid recovery and was able to return to work within three months. Since then he has been in very good health, does not have any pain, and is able to play tennis, and jump and vault as well as he ever could. There is some stiffness in the lower back, which is only noticed after remaining in a bent position for some time. When he gets up after bending over, there seems to be contraction in the muscles of the back in the lumbar region, and this takes a few moments to relax completely. He cannot bend with quite the same ease as he did before, but otherwise he considers himself perfectly well.

An interesting point in this history is the interpretation of the period of fever, six months after the beginning of the original attack, and four months after the onset of the symptoms of typhoid spine. It might be considered merely as the fever which accompanies the typhoid bone lesions in some instances, but its duration of nineteen days, the general appearance of the patient, the rose spots, increased splenic dulness, and positive diazo reaction, all seem to suggest either a relapse or a second attack. The blood culture was negative, and the Widal reaction was positive before the onset of fever. We decided to regard it as a relapse.

CASE II. Typhoid fever (paratyphoid infection); mild attack; onset of the symptoms of typhoid spine on the thirty-seventh day; definite bony changes found in the spine; recovery.

The patient was a colored male, aged twenty-eight years, a laborer, admitted to the Johns Hopkins Hospital on October 23, 1905, complaining of chills and pains over the body.

The family history was negative. There was no history of tuberculosis.

Previous History. He had the ordinary diseases of childhood, but there was no history of typhoid or rheumatic fever, pneumonia, or pleurisy. He had apparently had several attacks of malarial fever. Two years previously he had a primary sore and gave a definite history of secondaries. He had gonorrhœa twice, the last time being about six months before admission. He had drunk very little alcohol, and had always been a hard worker.

Present Illness. This began on October 23, 1905, with a chill, fever, and vomiting. The fever continued, and he had headache and backache. There had been repeated shaking chills. There had been some cough and loss of appetite, but no nose-bleed.

Examination. On admission the temperature was 104°, and the patient looked ill. There was no delirium. The tongue was coated. The lungs were clear on percussion, but there were a few rales on auscultation. The heart was of normal size, and the sounds were clear. The abdomen was natural, the edge of the liver was just felt, but the spleen was not palpable. No rose spots were made out. The blood count showed red cells, 5,096,000; leukocytes, 11,000; and hemoglobin, 95 per cent.

Two days later the patient complained of abdominal pain, and the leukocytes had fallen to 6000. On November 1 the edge of the spleen was just felt and the area of dulness was increased. Some rather suspicious rose spots were noted. The bronchitis continued. There was no special change in the next ten days, the patient going through a course like that of a mild attack of typhoid fever. The temperature became normal on November 14, the twenty-third day. All the blood counts had been practically normal. On November 28, after two weeks of normal temperature, it was noted that the

patient had great pain when he sat up, and that the back was held rigidly. He was up out of bed and felt well, but complained of severe pain in the spine. On December 9, the forty-eighth day of the disease, he still complained of severe pain in the back, but nothing definite could be made out over the spine, and there was then no local tenderness. The condition varied greatly, some days the patient being free from pain, and again crying and moaning constantly. He soon became very neurotic and showed hyperesthesia of the skin with increase of the reflexes.

The radiogram taken by Dr. Baetjer, on December 9, showed a definite deposit of new bone on both sides between the fourth and fifth lumbar vertebrae. The intervertebral region seemed entirely filled on both sides of the spine. The deposit of bone seemed to involve both the intervertebral disk and the lateral ligaments.

About December 12, the fifty-first day, he began to have slight fever, the temperature usually rising to 100° , and occasionally to 101° ; this continued off and on for about five weeks. At this time he was in a very nervous state, refused to make any effort to stir or sit up himself, and wept at the suggestion of movement by anyone else. When helped up it was found that the spine was held straight and seemed stiff. No local changes could be made out, although there was slight tenderness over the lumbar region and sacroiliac joint. During the next two weeks the patient complained of a great deal of pain, especially over the sacrum and iliac crests, but tenderness on pressure was always very variable. The movements at the hip were perfectly free, but with the thigh flexed on the body the leg could not be extended at the knee. The knee-jerks were very active. During this time he was steadily gaining in weight. On December 23 it was noted that there seemed to be more atrophy relatively in the legs than in the arms. The lumbar curve was almost obliterated, and there was marked muscle spasm on both sides of the spine. There was no pain on touching the skin or on pressure, except over the sacroiliac joint. The rigidity continued, but by January 10 the patient could sit up in bed. By January 25 he was able to stand with some support, but the back was held stiffly, and the patient could not be made to bend the spine. The radiogram taken on January 30 showed the same condition between the fourth and fifth lumbar vertebrae as before, but in addition the intervertebral space between the third and fourth lumbar vertebrae on the right side was slightly encroached upon by a bony deposit, which suggested that the process was extending. On January 31 it was noted that there was a double scoliosis, with the convexity to the right in the scapular region and to the left in the dorsolumbar region. The upper thoracic spine could be moved well, but there was limitation below, with more lateral movement to the right than to the left. Attempts to move the spine caused pain. There was no definite

area of tenderness to the left between the fourth and fifth lumbar vertebrae. There was no involvement of any other joints. There was some pain on pressure over the sciatic nerve.

On February 9 it was noted that there was very little movement in the spine, and the patient's legs were so weak that he had difficulty in standing, and no trial could be made of his attitude in touching the floor. There was almost a convexity in the lumbar region. The muscles of the right leg showed marked atrophy, the measurements being much less than those of the left leg. The knee-jerks were increased on both sides, but especially on the left. After this a plaster jacket was applied, and the patient began to walk about. The only pain was occasionally at night, when he discarded the jacket. He improved rapidly, gained weight, and the movements of the spine, except in the lumbar region, improved rapidly. He was discharged on March 16, in very good condition. The blood count throughout showed no special features. The urine showed a specific gravity, which varied from 1007 to 1030. Albumin was present during the first ten days, with hyaline and granular casts, but was afterward clear. The diazo reaction was not obtained at any time. Gonococci could not be found in scrapings from the urethra. The blood pressure during the fever varied from 95 to 115 mm. Hg.

The Widal reaction was negative on the sixth, ninth, and thirteenth days, and on six subsequent occasions. Blood cultures, taken by Dr. Howard on the ninth and fifteenth days, both gave a paratyphoid bacillus. This was agglutinated in the fourth generation by the patient's serum. Typhoid serum did not agglutinate the bacillus obtained from the patient's blood. The patient's serum did not agglutinate several other paratyphoid organisms. Cultures from the urine and stools were negative for paratyphoid and typhoid bacilli. The patient's serum agglutinated the organism from the first and the second cultures in dilutions from 1 to 20 to 1 to 1000.

The patient was seen on May 1, 1906. He looked very well, had done heavy laboring work without any trouble, and stated that, except for slight stiffness in the lower back, he was free of all effects of his illness.

The attack was rather a mild one, and the patient had no severe symptoms. As in the first patient, the neurotic features were very marked. The patient would whine and cry without being able to give any reason, and at times when he stated that there was no severe pain. Another striking feature was the rapidity of improvement after it once began.

The frequency of typhoid spine is difficult to estimate, but the number of instances reported in the last few years suggests that the condition must have often been overlooked previously. The

reported cases have recently been reviewed by Fluss,¹ who collected forty-six from the literature. The condition usually appears during convalescence and has been in males in about three quarters of the cases. Trauma seemed to have been a factor in a small number. In the majority the attack of typhoid fever was mild. There has been much difference of opinion as to the cause of the symptoms, but there can be little doubt of definite organic changes in at least some of the cases. Even in those without any definite evidence of local trouble, the suspicion of some process, apart from a neurosis, may well be entertained.

It is of interest to discuss the more prominent symptoms, in view of the changes found in the two instances here reported.

1. *Pain.* This is usually the principal symptom, is often referred to the lower dorsal or lumbar region, and may radiate around the body or down the legs. It is generally aggravated by any movement, either active or passive, and may be so severe that the patient implores those coming near not to touch him. In some it has been necessary to give chloroform. There is much variation in the site of pain, its production by pressure, and its presence from day to day. In one of the instances here reported the patient at times was entirely free from pain. Fluss found pain on pressure over the vertebra in 19, with rigidity in 14, and radiation in 14 among the series of 46 cases. Some had pain on pressure over the sacro-iliac joint. The character of the pain varies greatly, there are often severe paroxysms which may last for hours, and these may alternate with periods in which the pain is described as a dull ache. The pain may radiate along the intercostal nerves, around the abdomen to the genitals or down the legs. Some patients obtain the greatest relief by lying prone. Curiously enough, the pain is not easily influenced by drugs, and large doses of sedatives, even morphine, may have but little effect. This has been commented on by several writers and was especially marked in Case I.

As regards the explanation of the pain, while in some cases it may be a neurosis, yet to associate it with local changes in and about the spine seems most reasonable, certainly in many of the cases. It may be due to pressure from inflammatory processes, the deposits of new bone, or communicated inflammation. The other evidences of involvement of the nerves, such as the disturbances of sensation, altered reflexes, wasting, etc., must be remembered.

2. *Neurotic Features.* These are present in many of the cases and may be most marked. They may come on with surprising rapidity, so that soon after the onset of symptoms the patient becomes hysterical, loses all control over his inhibition, and is transformed into a whining, complaining individual with whom it is difficult to have any patience. A similar state is often found in

¹ Centrall. f. d. Grenzlg. d. Med. u. Chir., 1905, viii, No. 17 et seq.

spondylitis associated with other diseases, such as arthritis deformans, in which the patient loses all control over himself and shows the same lack of effect from sedatives. Any kind of pain has a demoralizing effect on the morale, but this seems to be especially marked in that due to such spinal conditions. After an attack of typhoid fever one can understand that a patient may be exhausted and have less resistance to the effect of pain, but this will not serve as an explanation for the same result in the other disease.

3. *Spinal or Nerve Disturbances.* In addition to pain there may be alteration of sensation, either paresthesia or anesthesia, as in eight of the cases collected by Fluss. Pain on pressure over the muscles and nerves has been noted. The reflexes may be altered, increased, diminished, or absent. They may vary from time to time and be more increased on one side than the other, as in Case II. Muscle spasms and rhythmical movements have been observed. Muscular atrophy may be marked and be more pronounced in one leg than in the other. Disturbances of the function of the bladder and rectum, both retention and incontinence, have been noted in a few instances. Kernig's sign has been noted in two cases in the literature and was present in the second reported here. Ankle clonus has been noted in three instances. While some of these conditions might be due to functional disturbance, yet the majority suggest organic change somewhere. This is especially suggestive when, as in Case II, the muscular wasting is most marked on the side which showed the most involvement in the radiogram.

4. *Muscles.* Weakness, atrophy, and muscle spasm have been the most marked signs. There may be paresis of the leg muscles, so that the patient regains very slowly the power of walking, or there may be difficulty in standing. These conditions were marked in the cases here reported. The atrophy may be partly responsible for this. Both these patients had great difficulty in stooping or rising, and they kept the hands on the thighs to aid and steady themselves. The atrophy may be more marked on one side than the other. Muscle spasm is usually most marked in the muscles of the back, which may be held constantly rigid or become so on any movement. Associated with this there may be marked spasms occurring during sleep.

Swelling of the soft parts was noted in three, and local redness and heat in two, of the forty-six cases collected by Fluss. Edema of the lumbosacral region has been observed. In another case, reported by Neisser,¹ disturbance of sensation and swelling occurred in the right lumbar region in the second week after the symptoms of typhoid spine appeared. An incision was made under local anesthesia, and a portion of muscle removed showed marked degener-

ation, with diminution of the nuclei, in part destruction of the sarcolemma, and vacuole formation. Five weeks later there was much the same condition on the left side. On incision, oedema was found, with inflammation and degeneration in the muscle. These muscle changes can hardly be regarded as due to neuritis, and were explained as being due probably to contiguity.

5. *Spine.* The conditions here vary from tenderness on pressure to the presence of deformity and deposit of new bone. *Tenderness* has been noted in about half of the cases and is usually most marked in the lower dorsal, lumbar, and sacral regions. It may be elicited by direct pressure or by pressing against the head or the feet. *Rigidity* is a common finding, and in the light of the present report may be due in some cases to definite bony deposits. This, however, is thus far only proved to occur in the lower spine and as the whole spine may be held rigidly, muscular fixation must play a large part. The attitude on any attempt to move or rise is characteristic, as also when the patients stoop or try to walk. *Scoliosis* was found by Fluss in five out of forty-six cases. It may be only temporary, as in the case reported by Neisser, referred to before, in which the scoliosis is described as like that of the "neurotic or neuralgic" type. Neisser regarded it as being due to the inflammation and contraction of the vertebral muscles. *Scoliosis* was noted in Case II. *Kyphosis* occurred in fourteen of the forty-six cases. It is usually lumbar or dorsal, in one case being cervical. It is remarkable that in most of these the deformity disappeared after a time. In some instances there has been pain on pressure over the sacro-iliac joint and rarely swelling.

6. *Bone Deposits.* The most important change is the deposit of new bone, as shown in the two instances reported here. The exact seat of this change is difficult to state. In the first it filled in the intervertebral space between the second and third lumbar vertebrae, apparently being deposited in the lateral ligament and forming bony union between the two vertebrae. In the second the process extended from the second to the fifth vertebrae and appeared to involve both the lateral ligaments and part of the intervertebral disks. So far as has been found these are the first reported instances of definite changes being found by radiograms. Cutler¹ reported a case with negative findings.

7. *Fever.* This has been noted in about half of the reported cases. It is usually somewhat irregular. In a few instances it has been accompanied by chills. There was fever in both our cases, in one regarded as occurring with a relapse, but in the other persisting for about five weeks in an irregular fashion. It is evident that when fever is present its occurrence must be regarded as evidence of an organic process.

¹ Boston Med. and Surg. Jour., 1901, cxlvi, No. 26.

8. *Leukocytes.* No special attention appears to have been paid to them and no marked increase has been noted. They rose to 10,400 in the first case, but were normal in the second during the period of symptoms from the spinal complication.

9. *Duration.* This has varied from two weeks to some months, and it has been two years before a patient has recovered his previous working ability. The duration in the first of our patients may be regarded as about six months until discharge from the hospital and nine until complete recovery. In the second it was about four months. The remarkable rapidity of improvement, when this has begun, is to be noted. As a rule, the patients are free from the acute symptoms in a very short time.

When an explanation of typhoid spine is sought we are compelled to advance suppositions instead of certainty, in the absence of any pathological examination. There seems little doubt, however, that it must be regarded as due to the local action of the bacillus. During an attack of typhoid fever the bacilli are present in the bones, and, as a rule, do not set up local changes until the latter part of the course or during convalescence. Why this should be is difficult of explanation. It seems most reasonable to suppose that the changes set up in the spine are due to the action of the bacilli there. As to why the lower part of the spine should be involved so frequently, no good explanation is advanced. The process may affect various structures—thus it may be osteitis, osteomyelitis, chondritis, perichondritis, periostitis, or a combination of these, and secondarily other structures may be involved. There may be both a spondylitis and a perispondylitis. As Gibney suggested in 1889, it may be an acute inflammation of the periosteum and the fibrous structures which hold the spine together. Arthritis of the vertebral joints is a possibility, but arthritis of any joint is very rare in typhoid fever.

With such local changes the explanation of the symptoms is easy. The possible influence of trauma is evident. The involvement of the bony structures accounts for the signs in the spine itself, the tenderness, muscular rigidity, and occasional deformity. The deposit of new bone or ossification of cartilage is like that seen in other conditions. When it is remembered that exostoses may appear elsewhere following the typhoid bone lesions, for example on the tibia, as in the case reported by Tapie,¹ it does not seem strange that this should occur in the spine. With an inflammatory periostitis new bone formation is not uncommon. In some instances the process probably extends to the adjoining structures, which explains the local swelling sometimes found, the œdema and muscle changes described by Neisser. The involvement of the nerve roots

¹ Arch. prov. de Med., 1900, ii, 145.

would seem to be an invariable sequence, either by pressure or contiguity. In some it may be possible that there may be some degree of pachymeningitis, which is suggested by Kernig's sign being occasionally present, as in Case II.

In view of all these evidences of an organic lesion it seems reasonable to conclude that in certain of the cases at any rate there are definite changes either in the vertebrae or adjacent structures. That these cannot always be demonstrated as definite bony changes is evident. The process may not extend so far. But as in the majority of pathological conditions there are grades of severity, why not in this? There are comparable instances in the acute attacks of arthritis deformans, in which with acute arthritis in the joints of the extremities there may be evidence of involvement of the vertebrae which leave no permanent change, so far as we can discover. This may be seen either in the cervical or lumbar regions. So that while the milder attacks of typhoid spine may not prove to be associated with a definite process in the vertebrae, yet as severe attacks have been, the probability of all being in the same class seems worthy of consideration. One question difficult of explanation must arise, namely, the reason why such typhoid bone lesions of the vertebrae do not go on to pus formation, as is so common in the bones elsewhere. To this no answer can be given, for there seems no reason why they should not. It is dangerous to predict, but if the view here expressed be correct, an example of pus formation in the vertebrae will probably yet be found. It must be remembered that typhoid bone lesions of the ribs which have gone on to swelling and fluctuation may subside without external discharge of pus.

"Typhoid Spine" Associated with a Paratyphoid Infection. It will be noted that a paratyphoid infection has been here considered as typhoid fever. At present it seems to me more reasonable to consider typhoid fever as a disease which may be caused by several of the typhoid-colon group of bacilli than to make separate headings for each variety of bacillus.

Relation of Infections to Spondylitis. The proof that following typhoid fever, due to infection with the typhoid or a paratyphoid bacillus, there may be a spondylitis, opens up a suggestive question as to the etiology of spondylitis in general. The condition here described does not differ from that found in arthritis deformans—especially the type sometimes spoken of as the osteoarthritic. As to the cause of this we are yet uncertain, but that it is due to an infection seems most probable. Is this infective agent a specific organism, or may the same result be caused by various organisms? Such cases as here reported appear to support the latter view.

The list of infections which may be followed by changes in the vertebrae is a long one: scarlet fever, measles, influenza, gonorrhœa, diphtheria, pycemia, phlegmon, pneumonia, and even a pustular

acne have been reported. Certain other diseases, such as purpura and scurvy, have been added. As to the reports of the condition following acute rheumatic fever one questions if some of them may not have been instances of acute arthritis deformans, wrongly diagnosed. As to the exact process in these we cannot decide as yet, but the possibility of a multiple causal agency opens up a fruitful line for further work.

Reference has already been made to the similarity in the clinical features between the cases of typhoid spondylitis and those associated with arthritis deformans. The essential conditions seem to be the same and the pressure sign also. From radiograms it would be impossible to distinguish one from the other.

CONCLUSIONS. 1. In certain instances of typhoid spondylitis there are definite bony changes in the vertebræ.

2. The general features of the condition suggest the probability of organic changes in the spine of some degree being a usual occurrence.

3. The similarity of the changes found in typhoid spondylitis and those in the spondylitis found in other infections, especially arthritis deformans, suggest that the latter may be due to various infective agents.

THE VALUE OF THE DIFFERENTIAL LEUKOCYTE COUNT IN DIAGNOSIS.¹

BY FREDERIC E. SONDERN, M.D.,

PROFESSOR OF CLINICAL PATHOLOGY IN THE NEW YORK POST-GRADUATE MEDICAL SCHOOL.

A STUDY of the results obtained from complete blood examinations in some 8000 cases in private practice in the course of a number of years, rather than theoretical reasoning, led to the conviction that the differential leukocyte count is a factor of prime importance in the diagnosis and prognosis of most inflammatory lesions, and that with a knowledge of its details, the degree of leukocytosis has a significance not appreciated otherwise.

In February of last year, in a paper read before the Surgical Section of the New York Academy of Medicine, I reviewed data from some 1400 surgical cases, which seemed to justify conclusions briefly as follows: The increase in the relative number of polynuclear cells is an indication of the severity of the toxic absorption, and the degree of leukocytosis is an evidence of the body resistance toward the infection. Furthermore, it was found that within reasonable limits the figures obtained would justify an inference as to

¹ Read at the meeting of the American Association of Pathologists and Bacteriologists, Baltimore, May 18, 1906.

the probable presence or absence of a purulent exudate. Purulent exudates were rarely if ever present with low polynuclear percentages, irrespective of the height of the leukocyte count; while very high polynuclear percentages almost invariably indicated their presence, even if the total leukocyte count was low. Since the publication of that communication many surgeons have tabulated the figures obtained in inflammatory cases, and find that they bear out my own observations.

C. L. Gibson¹ has compiled results obtained in some 200 cases at St. Luke's Hospital. In this article he advocates the use of a standard chart, which I can heartily endorse; by means of it the important factor of the relation between polynuclear increase and leukocyte increase is graphically demonstrated. The higher the polynuclear percentage as compared to the leukocyte count, the greater the probability of a purulent exudate. Gibson's conclusions are as follows: The differential blood count and its relation to the leukocytosis is the most valuable diagnostic and prognostic aid in acute surgical diseases furnished by any of the methods of blood examination. It is of value chiefly in indicating fairly consistently the existence of suppuration or gangrene, as evidenced by an increase of the polynuclear cells disproportionately high as compared with the total leukocytosis. The greater the disproportion the surer are the findings, and in extreme disproportions the method has proved itself practically infallible. As the relative disproportion between the leukocytosis and the percentage of polynuclear cells is of so much more value than the findings based on a leukocyte count alone, this latter method should be abandoned in favor of the newer and more reliable procedure.

H. C. Taylor² has made a study of several hundred gynecological cases at Roosevelt Hospital along these lines. His conclusions are practically the same.

J. F. McKernon has given this method of examination a careful trial in suppurative conditions associated with or following middle ear disease, and is also enthusiastic on this adjunct in diagnosis and prognosis. Time does not permit my giving a detailed account of the results in some 200 hospital and private cases that he kindly placed at my disposal, but they will be found in a paper which he read before the British Medical Association this year. In a general way I may add that suppurative bone processes do not give us figures as high as we generally see in suppurative conditions in the soft tissues, probably on account of slower toxic absorption.

This clinical material in a broad way substantiates fully my original claims. That cases are encountered which seem to belie this

¹ Value of the Differential Leukocyte Count in Acute Surgical Diseases, *Annals of Surgery*, vol. 1906.

² A paper read before the New York Obstetrical Society several months ago and as yet unpublished.

principle is not open to question, but careful analysis of the conditions present usually explains the apparent divergence, and I can but voice the conclusion that continued observation strengthens rather than weakens my belief that the differential count is a valuable adjunct in surgical diagnosis and may present diagnostic and prognostic data at a time when the clinical picture is confusing. I grant that the procedure is still crude and that many refinements are necessary to make it as useful as I should like, but this is only a question of research.

As regards disappointments and failures encountered in the application of this principle, I may say children do not give the uniform results obtained in adults; to begin with, the normal polynuclear percentage is a more variable quantity, and when children are severely infected it seems that a drop in the polynuclear percentage may be due to lack of ability to absorb additional toxic material, thus indicating a graver rather than an improved condition.

When pus is so confined that no toxic absorption occurs, or when a purulent exudate is the result of tuberculous or typhoid infection alone, there is no leukocytosis and no polynuclear increase. Experience also teaches that a mixed infection with (or following) tubercle bacilli or typhoid bacilli does not show the high polynuclear percentages obtained in primary staphylococcic or streptococcic infection. It is also found that the exact nature of the infection has a direct bearing on the degree of polynuclear increase, some organisms causing higher percentages than others, everything else being equal. A very small percentage of cases of error remains unexplained, and in these one must conclude that we are led astray by drawing inferences from a specimen which does not happen to be a proper indicator of the circulating blood, even if the technique is as good as understood.

From my experience with the method I believe that it merits every effort in the direction of improvement and that the disappointments encountered should stimulate such efforts rather than tend to condemn the procedure.

THE EARLY DIAGNOSTIC SIGNS OF INSULAR SCLEROSIS, WITH A CLINICAL REPORT OF FOUR CASES.

BY SANGER BROWN, M.D.,

PROFESSOR OF CLINICAL NEUROLOGY, UNIVERSITY OF ILLINOIS; CONSULTING NEUROLOGIST
TO THE COOK COUNTY HOSPITAL, CHICAGO, ILLINOIS.

PERHAPS there is no disease of the nervous system concerning the pathological anatomy and symptoms of which the average medical student is more ready to answer than insular sclerosis. He

is likely to remember very vividly the pictorial illustrations he has seen in his text-books, showing a brain and cord studded with tumors of various sizes, as well as sections showing their distribution and how sharply they are delimited from the adjacent normal tissue. But above all he recollects the symptoms—intention tremor, nystagmus, optic atrophy, and scanning speech—which he accepts as pathognomonic. It is true, these symptoms separately and variously combined are frequently seen in cases of insular sclerosis and are, I think, diagnostic, if not pathognomonic, of that disease; but they occur only in its later stages, as a rule, several years at least, after other symptoms, which if rightly understood would suffice for the diagnosis. It is not my purpose to deny that these signs are highly diagnostic of insular sclerosis, but to insist that they should be relegated to their proper position. The student or practitioner who looks upon them as essential symptomatic signs will recognize few cases in practice, at least in the early stages when the diagnosis is of most value. Compared with practitioners abroad, we have been slow to estimate properly the relative value of certain symptoms; very likely on this account we have so often failed to recognize the disease that Americans have been thought to enjoy a peculiar exemption from it. We have been led astray by these brilliant but falsely placed signals.

If we do not allow ourselves to be thus misled, we find insular sclerosis to be much more common than we had formerly supposed; perhaps, indeed, not less common elsewhere. In a recent article Edward Müller,¹ of Breslau, agrees with Strümpel, Hobhouse,² and others that multiple sclerosis is the most frequent coarse organic disease of the brain and cord with which people living in the country suffer, and is only second to syphilitic and parasymphilitic diseases among city dwellers. He further agrees with other observers in the view that only a small minority of the patients present the classical symptoms—nystagmus, scanning speech, and intention tremor. I know of no recent contribution to medical literature better calculated to correct the erroneous impressions regarding insular sclerosis, which I have just pointed out, than that by Dr. Ashley W. MacIntosh, of Aberdeen, Scotland.³ He carefully analyzes eighty cases of insular sclerosis, with special reference to the onset and the earlier symptoms, considering only those which had either come to autopsy or had been so long under observation as to leave no doubt of the diagnosis. Before presenting my own clinical notes, I shall reproduce from the paper above mentioned a tabulation showing:

Neurologisches Centralblatt, July 1, 1905.

Lancet, 1905.

³ Review of Neurology and Psychiatry, February, 1903.

THE EARLIEST SYMPTOMS NOTED (BY THE PATIENT) IN THE SERIES
OF EIGHTY CASES CONSIDERED.

(The groups are not mutually exclusive.)

I. Motor Paresis in 45 cases.	
Paresis of both legs (paraplegia)	17 (4 sudden)
Paresis of one leg	14 (2 sudden)
Paresis of one arm	8
Paresis of both arms	1
Hemiparesis	5 (1 sudden)
II. Sensory Symptoms in 29 cases	
Paresthesias of hands	10
Paresthesias of legs (especially feet)	10
Pains in legs	7
Pains in hand	1
Girdle sensation	3
Numbness of trunk	2
III. Ataxia or Tremor in 20 cases	
Ataxia of legs or unsteady gait	7
Ataxia or tremor of arms	13
IV. Sphincter Troubles in 5 cases	
Incontinence of urine	2
Retention of urine	2
V. Apoplectiform attack in 3 cases	
VI. Cerebral Symptoms (other than hemiparesis or apoplectiform attack) in 19 cases	
Amblyopia	12
Vertigo	4
Diplopia	4
Squint	2
Nystagmus	2
Headache (occipital)	1

CASE I.—Attacks of vertigo, with pains in the eyeballs and the nape for six years; some unsteadiness of gait from the first; later diplopia, amblyopia, paresthesia, and weakness of one leg, and sphincter involvement.

A. B., a male, aged thirty-five years, married, a bank clerk, was seen April 4, 1903. His family history was good, he has always had very good general health, and has been regular in his habits. About twelve years ago, while working in a bank with strong electric light in his eyes, he began to suffer with dizziness and pains in the eyeballs and suboccipital region. Hot compresses and rest relieved his pain and he began wearing glasses, though at that time no particular defect in vision was observed. He had several similar attacks when overworked during the succeeding six years, at the end of which time, when the symptoms were again very severe, diplopia when looking to one side (he has forgotten which) was added. There was also considerable blurring of vision, and the vertigo was so severe at times as to render walking almost impossible; but he always improved by rest. He continued to have attacks of varying severity until about six months ago, when vision began to fail perceptibly; objects seemed dim, causing him to strengthen the light and wipe his glasses. He did not notice that one eye was weaker than the other. There has always been some uncertainty

of gait since his first attack twelve years ago. He has noticed for the past two years that in urinating, the stream was small and weak, and that he had difficulty in beginning the act. The sexual appetite has been increased when the other symptoms were more active, and diminished at other times. About three years ago, when overworked, the left leg from the hip down began gradually to feel more and more like a wooden leg, and by the end of a week was at its worst, so that he was hardly able to drag along. After this it began to improve and after eight weeks was much better, but has never quite recovered the natural sensation. Eighteen months ago he had a similar attack in the left arm, which took about the same course, but sensory impairment was more noticeable than it had been in the leg and still persists. This was first noticed in the index finger. He could not use the arm or hand for several weeks and still has to give special visual attention to counting coin, which his occupation frequently renders necessary. Three months ago the muscles of the face drew to the left and there was marked numbness in that side of the face and tongue. This attained its highest degree in a few days and lasted about a month. His brain has felt tired during the past year, and there has been considerable pain through the eyes and back of the head, especially for the past three weeks.

Examination. The patient is well formed and well nourished. Sensation is impaired about equally for touch and pin-pricks on the left side, in the arm more than in the leg. There is a girdle sensation about the left wrist. The gait is distinctly ataxic; the tendon and skin reflexes are increased, and ankle clonus of brief duration may be elicited on the left side. Dr. Casey Wood, who referred the patient to me, reports the eye-grounds normal, but central scotoma almost complete in the right eye, while central vision is normal in the left. There is no nystagmus, scanning speech, or intention tremor.

In a letter dated February 20, 1904, the patient says among other things: "I would state that I am having serious trouble again, and even hedging my appetite as best I can, I get no relief. I am also glad to state that the optical trouble, which I was experiencing when with you, has almost entirely disappeared."

Though scanning speech, nystagmus, or intention tremor have not yet appeared in this case the nature of the symptoms and their course strongly tend to confirm the diagnosis.

CASE II.—Slowly progressive ataxia and weakness of the legs for six months; then numbness and ataxia in the hands with tonic spasm of the interossei; next diplopia for several weeks; paresthesia of the thighs extending to the feet; girdle sensation about the abdomen; sphincter involvement.

B. C., a male, aged forty-two years, married, a farmer, was first seen August 26, 1903. His parents were living and healthy, his general health had always been good except for occasional sick

headaches. Seven months ago, his fingers gradually became numb and awkward, and his hands had a tendency to assume accoucheur's position, but this could be easily overcome by an effort of the will. These symptoms gradually grew worse for about six weeks, remained stationary for about four weeks, and then steadily receded until three months ago, since which time they have remained as at present. The hands and fingers are somewhat numb and he has difficulty in holding a nail when in the act of driving it with a hammer. When at the worst he could not button his clothing, because feeling was so much impaired that he could not tell whether he was manipulating the button properly without looking at it, and on account of awkwardness. Weakness was not apparent, since, when these symptoms were at the worst, he could lift a pail of water as well as ever. About five months ago he began to have double vision, especially when looking to the right; it was very bad for three weeks, when it rapidly disappeared. The visual strength, however, was at no time impaired. Over a year ago he noticed awkwardness in his gait, particularly when walking over ploughed ground or over weeds; this has steadily, though slowly, grown worse, so that now he is quite unsteady, even on a floor, especially in the dark. About ten months ago he noticed his feet were unusually cold, both subjectively and objectively, but this condition only lasted about four or five months. Six months ago the forepart of each thigh became numb; this was relieved by rubbing and flexing the legs. The condition was rather more apparent on the left than on the right and after a few weeks' time appeared to be gradually transferred to the calves, from which it gradually extended downward and became most noticeable in the great toes. It was of such a nature that he could hardly tell when his feet came in contact with the ground, without looking, even if he stamped, as he sometimes did by way of experiment. This condition began to improve after a few weeks, but while at its worst he could hardly walk. While he was not conscious of weakness in his legs when walking, he would lift them with his hands in order to cross them while sitting. He distinctly remembers that they were lost in bed, that is, he had to move them about in order to locate them; even now the ground does not feel at all natural to his feet in standing or walking. About four weeks after the above sensory symptoms appeared in the thighs, he noticed a girdle sensation about the waist; extending over and somewhat below the umbilical region. This appeared to descend to the calves, where the same kind of sensation is still present in a modified form; it seems to him as if the skin were being distended from within. For about seven months past the legs have tired easily, but more so when the sensory disturbance was at its height. They still feel ill at ease and he changes their position often while sitting or in bed. He began to suffer with constipation about eight months ago, having been regular previously.

This was at its worst when he felt the girdle sensation about the abdomen, but he still suffers from it to some extent. He cannot strain at stool as effectively as before. When the girdle sensation about the abdomen was present he noticed trouble in urination; sometimes he was unable to use ordinary restraint when the desire came, but more frequently it took a long time to start the stream after he felt the desire, and when started it was small and weak, so that the act was greatly prolonged. The first impairment in sexual power appeared with the girdle sensation, when indeed it was entirely absent for a time, and it has not up to the present been quite so strong as formerly.

Examination. The patient is well-formed and well-nourished. There are no stigmata; the gait is stiff and ataxic; the tendon reflexes are increased; the plantar reflexes are slight; the cremaster, gluteal, and abdominal reflexes are absent. Sensation is distinctly reduced to pin-pricks on both great toes and in small areas over the lower extremities; but excepting the great toes, if a part is pronounced dull to pin-pricks at one time, a few moments later it may be pronounced sharp. Sensation is impaired in the upper extremities, where a firm pin-prick cannot be recognized as such. There is frequently an after-sting, especially below the elbows, like that so often met with in tabes. The analgesia shades off in intensity from the shoulder and extends over part of the scapular region on the left, with an occasional small patch on the chest. Touch is reduced so that it is easily demonstrated on the great toes and hands, less so on the wrist, and not at all elsewhere. The eye-grounds, vision, pupils, and urine are normal. There is no nystagmus, disorder of speech, nor intention tremor, and the handwriting is good.

March 31, 1905. There is considerable improvement in respect to sensation; he feels contact with the floor better, and a pin-prick is pronounced sharp everywhere. He still walks with a cane, however; the legs are stiff and move with an effort, especially the left, if he tries to step over anything, and the knee and Achilles jerks are increased. The trouble with urination has diminished. Otherwise he is not changed. There is no nystagmus, intention tremor, or disturbance of articulation.

A highly probable diagnosis might have been made in this case when the hands became affected. Prior to that time nothing more than ataxic paraplegia was present; but this, even when uncomplicated, ought to excite suspicion of commencing insular sclerosis. Prolonged periods of improvement and indeed almost complete remission of any or all the symptoms are not uncommon in insular sclerosis, as this case exemplifies.

CASE III. Attacks of "sprained" feeling in the ankles for six months; then the face drawn to one side for a few days; next diplopia with intention tremor and ataxia of the hands; weakness and paresis of the legs; girdle sensation, and sphincter involvement.

F. S., a female, single, aged twenty-four years, a teacher, was admitted to Kenilworth Sanitarium, May 20, 1905. Her mother is very nervous; one sister was ill in bed a year before her death—cause not known. Otherwise the family history is good. She had the common diseases of childhood. About two years ago she began to suffer a “sprained” feeling in the ankles, which was diagnosed as rheumatism. She had repeated attacks of this sort, sometimes accompanied by vomiting, and could hardly move about when at the worst. One and one-half years ago while teaching school, she had what was called a bilious attack, with nausea and vomiting; she was in bed a week, and a slight drawing of one side of the face was noticed. In November and December, 1904, while in college, she had double vision; she could not keep to the lines while writing, and the script was very irregular, due to tremor of the hands. She improved considerably after a few weeks, at which time the peculiar “sprained” sensation in the ankles gradually returned, together with a stiffness and inco-ordination, on account of which she was put to bed. She has not walked since. For the past two weeks she has also had incontinence of feces with rectal anesthesia, retention of urine, a girdle sensation, and a feeling of soreness and weakness in the epigastrium. Speech has been very slow and high-pitched. Menstruation has been quite irregular for several months.

Examination. The patient is well-formed, well-nourished, intelligent, without any evidences of stigmata. The urine and eye-grounds are normal; the pupils are equal and react well to light and accommodation. Vision and ocular movements are normal. Prisms were not used to test the relative strength of the ocular muscles. The deep reflexes are much exaggerated, more especially in the lower limbs, where there is ankle clonus and Babinski's sign. Sensation is lowered perceptibly to touch and pin-pricks, progressively from the knees downward, but not very profoundly. There is considerable ataxia observed in voluntary movement of the hands and legs, but nothing which could fairly be called intention tremor. On leaving the institution, July 1, she still showed very marked ataxia in her gait, though there had been much improvement in this respect. The voice was much more natural, though still high-pitched and whining. There was very little difficulty in urination, and she had gained very much in controlling the rectum. The general condition was excellent.

In the early months hysteria must have claimed attention in this case, and indeed it not infrequently happens that in young women a positive diagnosis cannot be made for months, or even years. I should have regarded the diplopia and drawing of the face to one side—probably paralysis rather than spasm—as suspicious features. A “sprained” and tired feeling in the ankles has been noted as an early symptom by other observers.

CASE IV.—*Diplopia for several months at the age of ten years; weakness and tremor in the legs and transient amblyopia at eighteen years; after this hemiparesthesia and anesthesia; period of mental confusion and indistinct articulation; intention tremor and ataxia of the right hand; deep reflexes exaggerated.*

M. S., a male, aged twenty-three years, was seen August 7, 1905. His parents are living and healthy, though his mother is nervous and comes of a nervous family; otherwise the family history is good. The patient is an only child and mentally is scarcely up to the average; he has been at various schools and his standing always has been considerably below grade. His general health, however, has been fairly good. When about ten years of age, he suffered from diplopia for several months, and then was free from it until eight weeks ago. He cannot remember if it was just the same upon the latter occasion as upon the former. For several years past his vision for distance has been indistinct at times. Four years ago, after walking for several miles, he suffered from weakness in the ankles, so that he could not go on with his companions, and three years ago he was very tremulous when standing "tenshun" (was attending a military school), and suffered from obstinate constipation. About two years ago, after an operation for appendicitis, he became very tremulous when standing, and had very marked, indeed disabling, intention tremor in the right hand; this has become worse since, but has been somewhat variable and associated with a very perceptible decline in muscular power. A year and a half ago, paresthesia appeared about the right ear and in a few days had extended over the whole right side, being most marked in the right leg. At this time there was considerable reduction of sensation to pin-pricks over the paresthetic area, and there was also a sensation of burning in the soles of the feet. There has been considerable variation in the sensory symptoms within the last year, since he has been using goat lymph, but not more than might be accounted for by the influence of suggestion. Two or three years ago there were some signs of mental confusion, lasting for a few months, with quite indistinct articulation. This was at its height while the paresthesia was most marked. It gradually disappeared.

Examination. The patient is a well-formed, well-nourished young man, with the mental characteristics of a lad of about twelve. When the hand is passed lightly over the soles or the legs below the knee, he complains of a very uncomfortable sensation; there is no material reduction of sensation to pinching, pin-pricks, or touch. The deep reflexes are very much exaggerated everywhere. There is pronounced intention tremor, especially of the right hand, which is so severe that he can hardly button his own clothing. The pupillary reflexes, vision, fundus, and ocular movements appear normal, though prisms were not used for testing the ocular muscles. There is considerable ataxia in the right leg. Station is not mate-

rially affected by closure of the eyes. There is no nystagmus, scanning speech, or noticeable defect in articulation.

The diplopia at ten years might have excited suspicion of insular sclerosis which would have been forgotten after a few years, no other symptoms having intervened in the meantime; this symptom, however, taken in connection with weakness and tremor of the legs and transient amblyopia were at least highly suggestive of the correct diagnosis.

The relative frequency of the various early symptoms is well indicated by the accompanying table, but a careful perusal of the report in which it occurs is necessary in order to understand the course and the associations of each.

While a more or less rapid development and decline of the symptoms, no matter how they may be combined, is most common in the early stages, a very gradual and steady advance of one or more of them is not infrequently met. Thus, in MacIntosh's series, in 12.5 per cent. the first symptoms were like simple spastic paraplegia. In some of these no other symptom was noted for (in two, six) years. Sometimes the paraplegia in cases of this kind was pretty steadily progressive, and in others transitory, disappearing entirely and reappearing later after the lapse of years. A paresis or paralysis of any part or parts developing acutely or suddenly and receding in the same way should be seriously thought of as possibly an early symptom of insular sclerosis, and in fact this may be said of nearly every symptom here tabulated. Paresthesia of various distribution, intensity, and course may be the sole symptom for many (in one case nine) years. Amblyopia was the only symptom noted in 5 per cent. of the cases for from three months to six years. It is very often transient at first, but later some degree of optic atrophy is almost invariable.

To be sure, one would hardly be justified in making a diagnosis of insular sclerosis based on a single symptom, but if this single symptom be spastic paraplegia, this disease is more probable than lateral sclerosis. In by far the majority of cases, it is rather a matter of weeks or months than years, when there is an association of symptoms which is strongly significant, and that too quite aside from nystagmus, intention tremor, or scanning speech. I will say here, parenthetically, that according to my own observation a disorder of articulation like that met with in certain stages of parietic dementia, is far more common than the so-called scanning speech.

If it is remembered that the so-called pathognomonic symptoms are seen, as a rule, only late in the course of the disease, their importance may be conceded. Indeed, some combination of them was relied on to establish the diagnosis in the tabulated cases herein presented which did not come to autopsy. Optic atrophy also was regarded as a cardinal symptom.

With perhaps the single exception of sphincter involvement, it

will be readily seen that in some cases many of the symptoms at the onset in their nature, distribution, and course are practically identical with those of hysteria; on this account hysterical symptoms should not be slighted. If they are the result of insular sclerosis, close and prolonged scrutiny will reveal indications of organic disease.

Edward Müller, in the article already referred to, states that he regards a peculiar affection of the optic nerve consisting mostly of a simple atrophic discoloration of the papilla, especially of the temporal part, as the most certain and important early sign of multiple sclerosis. He also holds, contrary to Oppenheim, that failure of the abdominal reflex is a highly diagnostic sign.

I saw Müller's paper only after my case reports had been prepared, and I did not direct my attention to the points he has emphasized as closely as I would do now. I examined the fundus, however, by the direct method according to my routine practice; and all the patients herein reported had been examined repeatedly by oculists—who failed to observe any anomaly of the papilla. Inasmuch as the personal equation must be a prominent factor in deciding just what variations in the color of the papilla indicate positive evidence of disease, I am doubtful if this sign will maintain the high place Müller has assigned it.

Without mentioning additional reasons, I may say I should not regard the condition of the abdominal reflexes as affording very conclusive diagnostic evidence of a disease of which the anatomical changes are scattered throughout the brain and cord. I may add, however, in reference to these two diagnostic criteria of Müller, that inasmuch as a patient is not likely to present himself for examination until some paresthesia, paresis, or amblyopia has appeared, they may be of great practical value taken in conjunction with other symptoms.

THE PRINCIPLES OF TREATMENT OF RENAL INSUFFICIENCY.

BY ROBERT B. PREBLE, M.D.,

PROFESSOR OF MEDICINE IN THE NORTHWESTERN UNIVERSITY MEDICAL SCHOOL,
CHICAGO, ILLINOIS.

WHILE the term insufficient kidney may be used to mean a variety of things, it is commonly employed in connection with the clinical condition known as uremia, a clinical picture varying greatly in its severity and manifestations and believed to be due to the retention within the body of materials normally excreted through the kidneys. How much our ideas of this important clinical manifestation will be modified by future work it is impossible to estimate, but it is certain that they will undergo important

modifications. To this, the common conception of renal insufficiency, one can add other things. Thus, one may regard the scanty urine in cases of uncompensated heart lesions and in fevers as forms of renal insufficiency. These cases, however, are essentially different from those ordinarily included in this term, because they are not due to primary changes in the kidneys, but are secondary to disturbances elsewhere. Another variety of this form of renal insufficiency is seen in cases in which some one or several of the urinary constituents is deficient because of insufficient intake. It is well to keep this fact in mind, because it sometimes leads to error in diagnosis, as is illustrated by the weight formerly often, and still sometimes, given to a low excretion of urea as an early evidence of nephritis, when in reality the low excretion is due to the diet or insufficient activity of the patient.

Still another variety of renal deficiency is seen in the appearance in the urine of bodies normally retained, such as albumin or sugar. These bodies may appear because of excessive intake, because of disturbances in metabolism, or because of changes in the kidneys themselves. One might perhaps include here also the various forms of polyuria, such as the hysterical polyuria, the critical polyuria of the infectious diseases, and diabetes insipidus.

Lastly, there is the possibility that the kidneys are organs of secretion as well as excretion, and there are some, particularly certain French workers, who contend that the kidneys supply an internal secretion and that deficiency in this secretion plays a part in the production of uremia. If this is true, we must add a third type of renal insufficiency, one of insufficient secretion.

Turning now to the question of the diagnosis of renal insufficiency, employing the term, as is common, to mean insufficient excretion of the products of metabolism normally excreted through the kidneys, we can say that the diagnosis may be easy or difficult, and that while we have a pretty definite idea of the clinical picture meant, there are difficulties when we attempt to measure the deficiency accurately and numerically. The need for greater accuracy in estimating the functional capacity of the kidneys has been forced upon us by the increasing frequency of nephrectomy, an operation which is only justifiable when we can believe that the other kidney has sufficient active epithelium to take over the work of both organs.

This need has led to the introduction of certain physicochemical methods, and methods of determining the permeability of the kidneys, and the secreting power of the kidneys. The methods borrowed from physical chemistry have for their object the determination of the molecular concentration of the urine, and they are all subject to the same objection. They are attempts to transfer to complicated and unstable solutions methods which in the physical laboratory, surrounded by many precautions and corrections, have led to most highly important results when applied

to simple solutions. Moreover, too little attention has been paid heretofore to the diet of the patient during the period of examination, although the influence of the water and salt intake is known to be very great. Furthermore, in a very large proportion of the cases, the urine has been obtained through the ureteral catheters, which are known to vitiate the results by exciting a polyuria, and important inferences have been drawn from the secretion of the kidneys for short periods, although it is a well-established fact that the character of the urine varies greatly from hour to hour, and that it is only from the total daily secretion that inferences as to the capacity of the kidneys can be drawn.

Of the various physical methods employed, cryoscopy is the one which has been most popular, and while somewhat troublesome in its application, it would nevertheless become a generally employed clinical method if it could be shown to measure accurately the functional activity of the kidneys. More recently the determination of the electrical conductivity of the urine has been tried, but this method requires such laborious precautions, particularly as to temperature, which greatly influences the conductivity of solution, that it can never be generally employed.

Still more recently stegmometry has been tried. This method is based upon the relation existing between the surface tension of fluids and their molecular weight: the higher the molecular weight, the lower the surface tension. The surface tension is determined by the number of drops which a measured quantity of the fluid makes from a certain measured dropper. The higher the surface tension, the fewer the drops; the fewer the drops the lower the molecular weight. The instruments in this method are far simpler than in the others, but they are subject to the same general objections. They are all designed to determine the quantity rather than the quality of the molecules.

Koranyi formerly held that if the kidneys were insufficient the products of metabolism were retained within the blood, thus raising its molecular concentration and lowering its freezing point. Normally, the freezing point of the blood is very constantly in the region of -0.56° C., and it was originally thought if the blood showed this freezing point the kidney could be regarded as sufficient. The more data have been accumulated, the more uncertain this inference has become, and I think that one may conclude from the work done so far in the determination of the molecular concentration of the urine and the blood that these methods are valuable only when taken in conjunction with the more purely clinical methods, and that one who submits to their guidance alone is bound to get into trouble.

Another method of attempting to measure the functional capacity of the kidneys is that of measuring their permeability to certain chemical substances given the patient, notably methylene blue and

indigo-carmin. These bodies must be given subcutaneously, for if given by the mouth we know nothing of the amount absorbed. Both bodies are subject to the common objection that we have no method of accurately measuring the amount excreted; to the methylene blue there is the additional objection that it is too unstable for a purpose of this sort. Potassium iodide has been used for this same purpose, but while the amount excreted can be accurately measured there is no certain relation between the amount given and the amount absorbed. To this method, there is the additional objection: it does not follow that because the kidneys are normally permeable to these bodies they are permeable to the bodies they should excrete.

On a somewhat different basis is the well-known phloridzin test. This is based on the fact that glycosuria follows the administration of this body, and the inference is that there is a parallelism between the amount of sugar and the quantity of renal parenchyma still functionally fit. In employing this test attention should be paid to the time at which the sugar appears and to the total amount of sugar excreted, rather than to the percentage of sugar.

Turning now to a consideration of the treatment of renal insufficiency, let me first say a word in regard to those cases in which the urinary insufficiency is merely one of quantity, cases in which there is no diminution in the excretion of the more essential elements of the urine, the water only being lessened. We find here cases of two types, the concentrated urine of cardiac failure, and that seen in the various acute infectious diseases. In the former the treatment is that of the cardiac failure: rest with digitalis or other cardiac stimulants, combined with vasodilators or vasoconstrictors, according to the cause which underlies the heart exhaustion. In these cases a restriction of the amount of fluids with exclusion of the chlorides from the diet is of great importance when the œdema is marked. In the latter group, that of the acute infectious diseases, the administration of large amounts of water is of importance, for in this way the excretion of the toxic products of the infecting agent is favored and they are diluted in their passage through the kidneys.

Far more important than these cases are those to which the term renal insufficiency is more generally and more properly applied, namely, the cases grouped under the term uremia. I believe that this is the result of the combined action of a wide variety of chemical bodies which have accumulated in the body through failure on the part of the kidneys. Since we do not know just what these bodies are, we do not know any specific antidote for them, and must, therefore, be guided by general principles. Evidently, the rational things to do are two: to prevent or limit as far as possible the further introduction of these bodies, and to further their removal. The relative importance of these varies in different cases, according

to the severity of the clinical picture. Thus, for example, if only the so-called prodromal symptoms of uremia are present, to lessen the introduction is of more importance than to hasten the removal of the toxic bodies; while in the severe cases, the maniacal, convulsive, or comatose cases, the reverse is true.

These toxic substances, whatever they may be, can reach us only in two ways; they may be absorbed from without or they may be produced within our own body; to limit them we must limit both their absorption and their production. Both of these sources can be influenced.

Toxic bodies are introduced with our food or medicine and others are produced within the gastrointestinal canal. The regulation of diet, therefore, is of major importance. Foods containing undue amounts of toxins, such as the various parenchymatous organs used for food, the various forms of game, foods which are highly seasoned, or contain large amounts of blood pigment, should be limited. For other reasons, foods containing much salt are to be avoided.

The best food is milk. It is not toxic, its molecular concentration is less than that of blood, and it is poor in chlorides. There are, however, some objections. It is deficient in certain food elements, faults easily corrected by the addition of cream and cereals; it contains an excessive amount of phosphates; and still more important it is subject to fermentation within the gastrointestinal tract.

The second important external source of toxins is the gastrointestinal tract. Fermentative processes of many kinds go on here, producing bodies of great variety, some of which are toxic. Fermentation within the canal must be limited, as far as it can be, by employing foods least likely to ferment. In addition, intestinal antiseptics of various sorts have been employed, but in using them, care should be taken to avoid those which in their excretion may irritate the kidneys. Equally important with the limitation of fermentation is the prevention of stagnation of the intestinal contents. Free purgation in these cases is demanded not only because the bowel bears something of a compensatory relation to the kidney, but because in this way absorption of toxins is lessened. It may even be possible that the latter factor is the more important of the two.

In exciting purgation it is better to use the vegetable rather than the saline purgatives, especially if large amounts are required, because the salines have the same influence upon the molecular concentration of the body fluid that sodium chloride has.

Before leaving the questions of food supply and fermentation a word should be said of the necessity of individualizing. The diet suited to one patient will not do for another; moreover, each patient's diet must be modified from time to time according to his

digestive capacity, the condition of his gastrointestinal tract, the presence or absence of œdema, and other factors.

The production of toxic bodies by the organism itself cannot be prevented or lessened below a certain point, for their production is one of the manifestations of life itself. Something, however, can be done toward lessening their production by securing for the patient as perfect bodily and mental quiet as circumstances will permit. The disease itself will force a certain degree of quiet, but often the patients drive themselves to do much which could easily be avoided.

Having limited as far as possible the amount of toxic material introduced into or produced within the body, it remains to lessen its effects by hastening its removal. As already stated, the relative importance of these measures varies and increases with the degree of renal insufficiency. In the milder cases moderate purgation and sweating are sufficient, but in severer cases there is nothing so useful as venesection. The amount of blood withdrawn and the frequency with which the section should be repeated, depends on the size of the individual, and the severity and persistency of the symptoms; but in all cases the phlebotomy should be looked upon as the first resort rather than, as it now too frequently is, the last resort. Bleed early and as often and as much as the symptoms demand. The bleeding is done for the distinct purpose of removing as large an amount of toxic bodies as is possible. It is not done for the purpose of lowering the blood pressure directly and should not be reserved for cases with high pressure.

The sweating and purgation are far less effective; indeed, it is likely that the only thing accomplished by sweating is the removal of water. These methods do slowly and incompletely what the phlebotomy does quickly and more effectively. Bouchard estimated that 32 grams of blood removed more toxins than 280 grams of fluid feces or 100 liters of perspiration.

In addition to the mechanical removal of the blood, mention should be made of the withdrawal of fluid from the thoracic or abdominal cavity, or from the œdematous leg by hollow needles. The paracentesis is sometimes literally a life-saving operation, the lungs and heart laboring under such conditions that their immediate relief is imperative. Recently, the withdrawal of fluid from the cerebrospinal canal by lumbar puncture has been advocated and employed with some asserted good results; but personally I have found nothing but failure.

In addition to these things which seemed to me most closely allied to the principles which underlie the treatment, so far as we know them, there is a great variety of things that should be done for the relief of individual symptoms. These, however, cannot be discussed at the present time.

THE TREATMENT OF TUBERCULOUS LARYNGITIS WITH CULTURE PRODUCTS, WITH OBSERVATIONS UPON THE ACTION OF SPECIFIC INOCULATIONS IN THE TREATMENT OF TUBERCULOSIS.¹

By F. M. POTTENGER, A.M., M.D.,

OF MONROVIA, CALIFORNIA,

PROFESSOR OF CLINICAL MEDICINE, MEDICAL DEPARTMENT OF THE UNIVERSITY OF SOUTHERN CALIFORNIA, LOS ANGELES, CALIFORNIA.

TUBERCULOUS laryngitis has long been looked upon as a most hopeless complication of a hopeless disease. The past quarter of a century has removed this hopelessness from pulmonary tuberculosis; through wider knowledge has come early recognition of the disease, and through rational treatment its curability has become established. Tuberculous laryngitis, however, still remains a serious complication, although its curability has been proved.

The importance of this complication cannot be underrated, since it is present in a large proportion of the patients suffering from pulmonary tuberculosis. There is a wide divergence of opinion as to its frequency. Percy Kidd² estimates that 50 per cent. of the subjects dying of tuberculosis have the larynx affected. St. Clair Thompson³ accepts this percentage as correct. Schaeffer⁴ found only 8 (or 2.6 per cent.) normal larynges in 310 persons suffering from pulmonary tuberculosis. Of these 64.6 per cent. were diagnosed as tuberculous. Heinze⁵ found laryngeal tuberculosis 376 times (or 30.6 per cent.) in 1226 postmortem examinations on tuberculous subjects at the Leipzig Pathological Institute. Schech⁶ found the larynx affected in 30 per cent. of tuberculous subjects, while Turban⁷ found only 74 instances (or 18.3 per cent.) among 408 cases of pulmonary tuberculosis. Von Ruck⁸ found tuberculous laryngitis, which could be diagnosed by ordinary inspection, in 260 (or 45.6 per cent.) of 570 cases. Careful inspection, however, after the administration of tuberculin revealed 166 more, making a total of 426 (or 74.73 per cent.). Of 94 cases which I reported recently there were 15 (or 15.95 per cent.) with laryngeal involvement of such a degree as to cause subjective symptoms. Of 65 patients

¹ Read at the meeting of the National Association for the Study and Prevention of Tuberculosis, Washington, D. C., May 17 and 18, 1906.

² Clifford Allbutt's System of Medicine, vol. v.

³ The Principles of Treatment of Tuberculous Laryngitis, Trans. British Congress on Tuberculosis, vol. iii, p. 356.

⁴ Cited by A. Fraenkel, *Specielle Pathologie und Therapie der Lungenkrankheiten*, p. 776. *Die Kehlkopfschwinducht*, 1879.

⁵ Heyman's *Handbuch*, Wien, 1898.

⁶ *Beiträge zur Kenntniss der Lungentuberkulose*, Wiesbaden, 1899.

⁷ *Journal of Tuberculosis*, 1903, vol. v, and Report of the Winyah Sanatorium for 1903 and 1904.

in the Pottenger Sanatorium at the present time 27 (or 41.54 per cent.) either have had or have now sufficient involvement for the diagnosis to be made by inspection. Thus it will be seen that my percentage of cases recognizable on simple inspection does not fall far short of that of von Ruck. It should be added, too, that most of the laryngeal involvements are in those who are in the advanced stage of the disease. If our inquiry were confined to the advanced cases there is no doubt that more than 50 per cent. would show tuberculous laryngitis, thus confirming the percentages of Kidd, St. Clair Thompson, and Schaeffer.

Tuberculosis of the larynx manifests itself most often in the form of infiltration. Sometimes this infiltration breaks down and forms ulceration. Tuberculomas are sometimes formed; miliary tubercles are occasionally seen; and less often the disease manifests itself as a perichondritis.

The diagnosis of tuberculous laryngitis is largely a matter of experience. The physician who is in the habit of seeing these cases often will rarely be mistaken. The disease is usually secondary, and rarely occurs unless the lungs are affected. It is most commonly found when the pulmonary condition is somewhat advanced. While it must be borne in mind that a tuberculous patient is subject to all the forms of non-tuberculous throat trouble, yet repeated examinations by a skilled laryngologist will rarely fail to differentiate the tuberculous from the non-tuberculous. In this, as in other forms of tuberculosis, an early diagnosis is very desirable, since the prognosis is much more favorable in slight infiltration than it is in extensive infiltration with great thickening or after ulceration has occurred.

The prognosis in tuberculous laryngitis has always been considered grave. In fact, I believe it is the opinion of nearly all physicians that when the throat becomes affected there is no hope. Sir Morrell Mackenzie¹ wrote in 1880: "The prognosis is always extremely grave, and it is not certain that any cases recover." Lennox Browne² in 1893 said: "The prognosis is seldom doubtful, and we are not justified in giving other than an unfavorable prognosis either as to recovery of health or duration of life." West³, in 1902, shared the general hopeless view, saying: "The prospects of cure are very slight." Lake⁴, in 1905, took a much more hopeful view, saying: "If tuberculous laryngitis is treated from its commencement, the disease can be controlled, in very many cases completely cured, and in others the onset of severe symptoms can be prevented." Tyson⁵ in 1906 says: "The prognosis of tuberculous laryngitis is unfavorable at best."

¹ Quoted by Lake, *Laryngeal Phthisis*, 1905, p. 85.

² *Diseases of the Throat*, 1893, p. 418.

³ *Diseases of the Organs of Respiration*, p. 81

⁴ *Ibid.*

⁵ *Practice of Medicine*, fourth edition, 1906, p. 512.

In order to substantiate his favorable prognosis Lake¹ says: "In the first edition of this work I recorded 48 cures out of 329 cases (or 14.59 per cent.); and from 1901 to 1903 inclusive, I have to record, out of 211 cases, 44 cures (or 20.85 per cent.) and 14.21 per cent. 'much improved.' The 'cures' include all cases discharged from the hospital with no visible lesion of the larynx (scars, etc., excepted); many cases were in an early stage, and many very slight cases of cord trouble are included." This very gloomy picture showing only one out of five cases of tuberculous laryngitis as cured when "many cases were in an early stage, and many very slight cases of cord trouble are included," is one of the brightest that can be found. It is even dazzling when compared with others.

How different this is from the report of von Ruck,² who obtained either a disappearance of all signs or a condition no longer reacting to tuberculin in 353 (or 82.86 per cent.) of 426 cases of laryngeal involvement treated at the Winjah Sanitarium.

In a recent paper³ I reported 94 cases of pulmonary tuberculosis complicated in 15 instances by laryngeal tuberculosis, all of which were sufficiently advanced to cause symptoms on the part of the patient. Of these 15 cases there was apparent healing, so that there was no further reaction to tuberculin (in 11 or 73.33 per cent.). In one other case there was a healing of a large ulcer and an arrest of activity, although the patient still reacted to tuberculin. At the last report, which was more than a year after discharge, the throat was still in an arrested condition. To these could be added several more patients who are cured of their laryngeal involvement, but who are still under treatment for their pulmonary condition, but I will confine my report to these 15 cases.

These results are so different from those usually obtained, and so out of harmony with the prognosis usually given, that I shall give brief notes of the case-histories, together with the final results.

Case 133. Female, aged twenty-eight years; history positive; ill four years; dense infiltration and cavity in the right upper lobe; both cords, interarytenoid space, and both arytenoids infiltrated; weight 114 pounds; temperature 99.5°; pulse 90; digestion good; bacilli present; sputum, one-half ounce in twenty-four hours. Treated two years; on discharge pulmonary lesion healed; weight 130 pounds; temperature 98.6°; pulse 75; digestion good; bacilli absent; lungs and larynx apparently cured.

Case 166. Female, aged thirty-one years; history positive; ill four years and eleven months; infiltration in both upper lobes and the upper portion of the right lower lobe posteriorly; a cavity in the right upper lobe; infiltration of both cords and both arytenoids with

¹ Laryngeal Phthisis, 1905, p. 85.

² *Ibid.*

³ *Journal of Treatment in Ninety-four Cases of Pulmonary Tuberculosis, Therapeutic Results*, 1906.

tumefaction; weight 123 pounds; temperature 98°; pulse 108; digestion good; bacilli present; sputum, two ounces in twenty-four hours. Duration of treatment, eleven months; on discharge a few rales at the site of the cavity; weight 130 pounds; temperature 98.4°; pulse 81; digestion good; bacilli present; sputum scant; larynx apparently cured; pulmonary condition arrested.

Case 183. Male, aged thirty-five years; history negative; ill three years and six months; dense infiltration of the entire left lung and the upper lobe of the right; a cavity in the left upper lobe; both cords ulcerated; interarytenoid space infiltrated; weight 114 pounds; temperature 100.8°; pulse 96; digestion good; bacilli present; sputum, four ounces in twenty-four hours. Duration of treatment, nine months; on discharge infiltration lessened throughout; weight 119 pounds; temperature 100.2°; pulse 100; digestion good; bacilli present; sputum, four ounces in twenty-four hours; larynx and pulmonary condition unimproved.

Case 192. Male, aged twenty-six years; history negative; ill four years; dense infiltration in both upper lobes; foci scattered throughout the rest of the lungs; a cavity in right upper lobe; aphonia; both cords infiltrated and the right ulcerated; tumefaction of both arytenoids; weight 112 pounds; temperature 101°; pulse 100; digestion poor; bacilli present; sputum, three ounces in twenty-four hours. Duration of treatment, six months; on discharge slight infiltration of both upper lobes; weight 118 pounds; temperature 100.6°; pulse 96; digestion fair; bacilli present; sputum, two ounces in twenty-four hours; larynx and pulmonary condition improved.

Case 201. Female, aged thirty-one years; history positive; ill one year and two months; dense infiltration of the entire left lung; infiltration of the interarytenoid space; weight 107 pounds; temperature 102°; pulse 120; digestion poor; bacilli present; sputum, one ounce in twenty-four hours. Duration of treatment, six months; on discharge slight lesion of the left apex; weight 131 pounds; temperature 98.6°; pulse 90; digestion excellent; bacilli absent from sputum; larynx apparently cured; pulmonary condition arrested.

Case 202. Female, aged twenty-one years; history positive; ill five years and nine months; infiltration of the entire right lung with cavity in the upper lobe; infiltration of the left upper lobe; infiltration of the interarytenoid space and both arytenoids; weight 75 pounds; temperature 99.6°; pulse 96; digestion poor; bacilli present; sputum, three ounces in twenty-four hours. Duration of treatment, nine months; a few rales about the cavity, otherwise clear; weight 99½ pounds; temperature 98.6°; pulse 78; digestion good; bacilli present; sputum, one and one-fourth ounces in twenty-four hours; larynx apparently cured; pulmonary condition arrested.

Case 204. Female, aged thirty-five years; history positive; ill five years; dense infiltration of the entire right lung; cavity formation in the upper lobe; recent infiltration of the left upper lobe;

aphonia; both cords with interarytenoid space, and both arytenoids infiltrated; weight 115 pounds; temperature 104°; pulse 110; digestion poor; bacilli present; sputum, four ounces. Duration of treatment, one year; on discharge a few rales about the cavity; weight 140 pounds; temperature 98.6°; pulse 76; digestion excellent; bacilli present; sputum, one-half ounce in twenty-four hours; larynx apparently cured; pulmonary condition arrested.

Case 215. Female, aged thirty-two years; history negative; ill three years and three months; dense infiltration of both upper lobes; slight infiltration of interarytenoid space; pleurisy with effusion; weight 125 pounds; temperature 102°; pulse 102; digestion poor; bacilli present; sputum, one-half ounce in twenty-four hours. Duration of treatment, one year; on discharge left lung nearly clear; slight infiltration of the right upper lobe; weight 138 pounds; temperature 99°; pulse 90; digestion good; bacilli present; sputum scant; larynx apparently cured; pulmonary condition improved.

Case 218. Male, aged forty-six years; history positive; ill eighteen years and three months; dense infiltration of the left lung; moderate infiltration of the right upper lobe; cavity in the right lobe; infiltration of both arytenoids and interarytenoid space; weight 131½ pounds; temperature 99.2°; pulse 96; digestion poor; bacilli present; sputum, two ounces in twenty-four hours. Duration of treatment, three months; on discharge moderate infiltration of the left upper lobe; weight 151 pounds; temperature 98.6°; pulse 90; digestion good; bacilli present; sputum scant; larynx apparently cured; pulmonary condition arrested.

Case 297. Female, aged thirty-nine years; history positive; ill one year and five months; dense infiltration of the right upper lobe; moderate infiltration of the middle and right lower and left upper lobes; slight infiltration of the interarytenoid space; weight 110½ pounds; temperature 98.8°; pulse 90; digestion good; bacilli present; sputum scant. Duration of treatment, eight months; on discharge pulmonary lesion healed; weight 124 pounds; temperature 98.6°; pulse 80; digestion good; bacilli absent; sputum none; larynx apparently cured; pulmonary condition apparently cured.

Case 308. Male, aged forty-five years; history negative; ill one year and three months; slight infiltration of the right upper lobe; slight infiltration of the interarytenoid space; weight 140 pounds; temperature 98.4°; pulse 68; digestion good; bacilli present; sputum scant. Duration of treatment, three months; on discharge, lungs clear; weight 151 pounds; temperature 98.4°; pulse 70; digestion good; bacilli absent; sputum scant; larynx apparently cured; lungs apparently cured.

Case 263. Male, aged forty years; history positive; ill one year and nine months; dense infiltration of the entire left lung and upper lobe of the right lung; scattered infiltration of the lower lobe of the right lung; infiltration of both cords with ulceration; interarytenoid

space and both arytenoids infiltrated; weight 164 pounds; temperature 99°; pulse 96; digestion good; bacilli present; sputum, one ounce in twenty-four hours. Duration of treatment, ten months; on discharge left lung nearly clear; dense infiltration of the right upper lobe; scattered foci through the middle and lower lobes; patient suffering from hydropneumothorax; weight 140 pounds; temperature 102°; pulse 120; digestion poor; bacilli present; sputum two ounces in twenty-four hours; larynx unimproved; pulmonary condition unimproved.

Case 18. Male, aged thirty-two years; history positive; ill nine years and six months; dense infiltration of the entire left lung; slight infiltration of the right upper lobe; infiltration of both cords; weight 145 pounds; temperature 99°; pulse 84; digestion fair; bacilli present; sputum, two ounces in twenty-four hours. Duration of treatment, two years and six months; on discharge slight infiltration at left apex; weight 159 pounds; temperature 98.6°; pulse 66; digestion good; bacilli present; sputum, one-fourth ounce in twenty-four hours; larynx apparently cured; pulmonary condition arrested.

Case 47. Male, aged twenty-seven years; history positive; ill four years; dense infiltration of the right upper lobe with cavity; moderate infiltration of the entire left lung; aphonia; infiltration of both cords with ulceration; ulcer in the interarytenoid space; infiltration of both arytenoids; weight 112 pounds; temperature 100.4°; pulse 84; digestion poor; bacilli present; sputum, one ounce in twenty-four hours. Duration of treatment, one year and five months; on discharge slight signs about cavity; weight 118 pounds; temperature 100°; pulse 100; digestion fair; bacilli present; sputum, one and one-half ounces in twenty-four hours; larynx apparently cured; pulmonary condition improved.

Case 56. Female, aged thirty years; history negative; ill three years and one month; moderate infiltration of the entire left lung and upper lobe of the right; infiltration of the right cord; right ventricle bulging with ulcer; both arytenoid and interarytenoid spaces infiltrated; weight 94 pounds; temperature 101°; pulse 120; digestion good; bacilli present; sputum, six ounces in twenty-four hours. Duration of treatment, one year and ten months; on discharge slight infiltration of the left upper lobe; weight 97 $\frac{3}{4}$ pounds; temperature 99.6°; pulse 84; digestion good; bacilli present; sputum, three ounces in twenty-four hours; condition of larynx, arrested; pulmonary condition arrested.

Before entering upon the subject of treatment, I wish to say a few words about early diagnosis. It is not necessary to emphasize the necessity of early diagnosis in pulmonary tuberculosis, but I feel that we should broaden our teaching and insist upon the early diagnosis of tuberculosis wherever found. We should not be satisfied with an examination of the chest, but we should examine for tuberculosis elsewhere; above all, the larynx should never be

neglected; for even conservative men estimate that one-third of those who have pulmonary tuberculosis have the larynx affected, and the evidence is quite clear that one-half would be within the truth.

As the time to treat pulmonary tuberculosis is in its incipency, so is this the time to treat the laryngeal form of the disease, since the prognosis becomes graver the farther advanced the condition.

In treating laryngeal tuberculosis, it must be borne in mind that it is nearly always secondary to tuberculosis elsewhere, usually in the lung; and any treatment that is expected to be of value must include the treatment of the other conditions present. We must not expect to heal tuberculosis of the larynx by local applications in very many cases, nor must we expect to accomplish our results quickly. It is a matter of time and patience. We must not expect very satisfactory results except in institutions where the patients are under constant care and guidance and where they can be cared for for a prolonged period of time.

The indications for treatment are the same as for the treatment of tuberculosis elsewhere: (1) To increase the resisting power of the patient; (2) to prevent the disease from spreading to new tissue; and (3) to heal the local lesion.

The resisting power of a patient is supposed to depend very largely upon his nutrition, hence all that tends to improve this, such as open-air, hygienic living, good food, carefully regulated rest and exercise, hydrotherapy, and various other tonic measures find place in the treatment of tuberculous laryngitis.

In order to cure the local ulceration, Krause¹ introduced lactic acid in 1885; and, in 1887, Heryng² advocated the curetting of the tuberculous process and after-treatment with lactic acid, hoping in this way to eradicate the disease. While this surgical treatment is not founded on a rational basis, because it is not often possible to extirpate all the diseased area and if healing takes place ulceration usually soon supervenes again, yet the work of Krause and Heryng undoubtedly has done much to advance the treatment of this affection by calling attention to the fact that it can sometimes be cured.

To prevent the disease from spreading, and to heal the local lesion we have one method of treatment which offers great hope, that is inoculation. Inoculation of specific toxins imitates nature's method of curing disease. Recent studies in immunity show that the specific antibodies which bring about a cure in diseases of microbic origin are produced by stimulation of the body cells by means of specific toxins. If the quantity of toxin is small, the cell responds by the formation of antibodies; if the quantity of toxin is large, the cell is destroyed and the cure prevented. Therefore, by the inoculation

¹Berl. klin. Woch., 1885.

²Die Heilbarkeit der Larynxphthisis und ihre chirurgische Behandlung.

of specific toxins in the proper amounts we can increase the defensive powers of the organism. That this occurs I believe from clinical experience, and can be proved by laboratory methods.

The toxin used in the treatment of tuberculosis is usually known as tuberculin. Tuberculin is a broad term which includes several different preparations, as old tuberculin and new tuberculin (Koch), Hunter's modification of old tuberculin, antiphisin (Klebs), tuberculin (Denys), tuberculin (Beraneck), watery extract of tubercle bacilli (von Ruck), P.T.O. (Spengler), and numerous others. The action of all these various tuberculins is similar in part, yet different. Some are much safer to use than others and some seem to produce better results than others.

My experience with P.T.O. (Spengler) is very encouraging. P.T.O. is made from bovine bacilli. Its use will throw light upon the question of the identity and intertransmissibility of bovine and human bacilli. These tuberculins are very different. P.T.O. will immunize against the human toxin much stronger than the human will against the bovine toxin, for example; when we have carried our dosage of P.T.O. up to say 100 mg., we can begin and within a very short time attain a high dosage of human tuberculin. When we have arrived at a dosage of 100 mg. of human tuberculin, however, and wish to change to P.T.O. we must increase our dosage of P.T.O. much slower. P.T.O. will also raise the agglutinating power of the blood to a much higher degree than the human tuberculin, and this power of agglutination will last longer.¹ The reactions from the products made from bovine and human bacilli differ also.

The preparation which I have used for the most part and the one which I have used in all the cases reported herewith is the watery extract of tubercle bacilli (von Ruck). This preparation is made from the powdered bodies of tubercle bacilli, by extraction with distilled water after the culture fluid has been removed by washing and the fats by extraction with alcohol and ether. The product is standardized so that a given solution known as Solution No. 100, represents 1 per cent. of the solid matter derived from the bodies of the bacilli by the above method of extraction. The dilution is made with normal salt solution to which 0.4 per cent. of carbolic acid has been added. This preparation represents a greater amount of soluble extract from the bodies of the bacilli than any other, and hence is presumably superior in its immunizing properties. It is a stable preparation and can be kept for months without deteriorating, which facilitates ease and economy of administration.

In order to understand the manner in which these remedies produce their beneficial action, it is well to inquire into the manner in

¹ Ein neues immunisierendes Heilverfahren der Lungenschwindsucht mit Perlseuchttuberculin, Deut. med. Woch., 1905, Nos. 31 and 34.

which the disease spreads in the body and also into nature's way of effecting a cure. Tuberculous processes usually show a tendency to spread to adjacent parts, and the lesion itself heals very slowly, if at all. Any remedy then that will stimulate healing in the local lesion and any remedy that will counteract the tendency of the disease to spread will meet the two principal indications in the treatment of tuberculosis.

Man, when in health, is naturally resistant to tuberculosis. He is able to take moderate quantities of tubercle bacilli into his system without infection resulting. The normal resisting power of the body overcomes the invading organisms. If, however, the number of bacilli becomes greater, or if the inoculation be of a very resistant race of bacilli, or if the normal resisting power of the individual be lowered, infection is likely to occur.

Here, then, lies the explanation why tuberculosis is easier to cure when the lesion is small. There are fewer areas from which the disease is attempting to spread and consequently the defensive powers of the organism are not so heavily taxed in destroying the bacilli which are attempting to form new foci; and the larger the focus the more the natural defenses of the organism are depressed. This also explains why the maintenance of nutrition, as is done by the hygienic-dietetic-open-air treatment, is so important. A high degree of nutrition enables the organism to form more defensive bodies than a low degree.

That the natural resisting power of the organism is lowered when an infection occurs has been shown by the important works of Bullock¹ in determining the opsonic power of the blood.

When an organism has been infected with a certain micro-organism, the power of the blood for destroying that specific organism becomes lowered. In individuals suffering from tuberculosis, this power is sometimes reduced a quarter, a half, or even three-quarters.

The opsonic power of the blood can best be raised by inoculation with a specific toxin. If the individual be suffering from a staphylococcic infection, the opsonic power of his blood toward the staphylococcus is lowered and can be increased by inoculation of staphylococcic vaccine; if a tuberculous infection, the opsonic power is raised by inoculation of toxins from the tubercle bacillus or tuberculin.² By the proper use of tuberculin, the opsonic power of the organism can be raised from one-quarter, one-half, or three-quarters of the normal to above normal.

Tuberculin, then, is indicated in the treatment of tuberculosis

¹ On the Variation of the Opsonic Power in Health and Disease, *London Hospital Gazette*, 1905, xi; Inquiry into the Opsonic Content of the Blood Serum in Healthy Individuals and in Patients Affected by Lupus, *Trans. Path. Soc. Lond.*, 1905, vol. lvi, p. 334.

² For a review of the literature see Potter, Ditman, and Bradley, *AMER. JOUR. MED.*, 1906, cxxii, 186.

because it will increase the power of the blood to destroy bacilli, thus aiding in the destruction of the germs in the foci which are present, and also protecting the organism against further invasion. One of the difficulties encountered in the treatment of tuberculosis lies in the fact that the bacilli are shut up in the tubercles where the blood cannot reach them easily. Hence, cure is slow. The organisms which make their way out of the tubercles, however, and which tend to set up lesions in adjacent or distant parts can be reached more easily, and if they can be bathed in a serum rich in protective substances, they will be destroyed before they can cause infection; unless, as stated above, they be very virulent or come in too large quantities.

Tuberculin does more than this. It stimulates the tuberculous focus and hastens healing. Following an injection of the proper dose of tuberculin a slight hyperemia of the area involved occurs; this passes off sometimes within a few hours, sometimes after two or three days. By keeping up this stimulation at proper intervals for sufficient time, we assist nature very materially in her effort to cure the lesion.

The larynx is the ideal location for a lesion to be treated by tuberculin, for the dosage can be controlled absolutely by the local reaction produced. The larynx should be watched daily and the dosage should not be increased beyond that which is necessary to produce a slight reaction; nor should a second injection be given until all reaction produced by the first has disappeared.

Tuberculin administered in this manner will cure many cases of tuberculous laryngitis. It will increase the chances of recovery in these cases from 50 to 75 per cent., and in many cases it offers practically the only hope.

In conjunction with it, all measures which will improve nutrition should be used. The local lesion should be kept clean by suitable bland sprays. If ulcerations are present they may be treated with protargol, 10 per cent., and if painful should be dusted with orthoform. At times when pain is excessive and cough very troublesome, this may be allayed by adding $\frac{1}{12}$ grain of heroin hydrochlorate to the orthoform. Rest of the larynx should be insisted upon. The patients should be requested to talk as little as possible, and when necessary, preferably in a whisper. A cold compress to the throat at night aids in relieving cough. Focusing the sun's rays upon the parts affected, after the method of Sorgo,¹ or using the violet rays, seems to aid somewhat, perhaps by causing an increase of blood to the parts and thus affording greater opportunity for the protective action of the serum. I have never found it necessary to resort to operative procedures, nor have I used any remedies of severe action.

¹ Ueber die Behandlung der Kehlkopftuberkulose mit Sonnenlicht nebst einem Vorschlag zur Behandlung derselben mit künstlichen Lichte, Wien. klin. Woch., 1905, vol. xviii, No. 4.

REVIEWS.

THE PRACTICE OF PEDIATRICS. In Original Contributions by American and English authors. Edited by WALTER LESTER CARR, A.M., M.D., Consulting Physician to the French Hospital, New York. Illustrated with 199 engravings and 32 full-page plates. Pp. 1014. Philadelphia and New York: Lea Brothers & Co., 1906.

THIS handsome volume is the joint work of twelve American and two English writers. While we miss from this list familiar names that have been long identified with systematic text-books on pediatrics, it is a pleasure to welcome this new presentation of the subject from the pens of younger men whose writings have already given them authoritative standing in the ranks of medical authorship. We are, therefore, prepared to find, in the volume before us, a certain freshness of thought and novelty of presentation that could not be expected anew from men whose writings have become classic; and in this anticipation we have not been disappointed. Dr. Carr, whose long service as editor of the *Archives of Pediatrics* has given him unusual opportunities of knowing his contemporaries, is to be congratulated upon his happy choice of co-workers, each of whom is given sufficient space and a completeness of assignment to secure homogeneous results and a well-balanced presentation of the subject. It is only to be regretted that Dr. Carr has seen fit to omit his own name from the list of writers—an innovation in a composite volume of this kind that will be resented by thousands of the editor's friends, who certainly have a right to expect from his practiced pen something more valuable than the necessary editorial preface.

Section I, of sixty pages, devoted to the diseases and injuries of the newborn, has been most wisely entrusted to Edward P. Davis, of Philadelphia, whose writings on this subject are well known and authoritative. The subject of the premature infant is especially well handled and the section on injuries and infections of the newborn is very completely covered and very well illustrated. Section II, development, growth, and hygiene, covering twenty-seven pages, is the work of Leroy M. Yale, of New York, easily the dean of the contributors, whose earlier writings on the subject have become classic. Section III, covering eighty-six pages, on infant feeding, by Thomas S. Southworth, of New York, gives an illuminating review of the latest knowledge on this most important department

of pediatrics. We do not know of any recent treatment of the subject that so completely covers the ground in all its aspects, especially upon the practical management of artificial feeding and the scientific treatment of difficult cases. The very important division upon diseases of the alimentary tract, by David Bovaird, Jr., of New York, covers 146 pages. It is a very concise and up-to-date presentation. Especial commendation must be made of the many valuable and well-grounded hints that are embodied in the sections on the treatment of the acute and chronic gastrointestinal diseases. Rachitis, scorbutus, and marasmus are adequately covered in a section of twenty-two pages, by George M. Tuttle, of St. Louis.

Section VI, infectious diseases, covering 242 pages, is the work of Isaac A. Abt, of Chicago; David Bovaird Jr., of New York; D. J. McCarthy, of Philadelphia; Matthias Nicoll, Jr., of New York; John Ruhrah, of Baltimore, Floyd M. Crandall, of New York, and George M. Tuttle, of St. Louis. The first three of these writers have divided the work on a very satisfactory presentation of tuberculosis, Dr. Abt treating the subject in general, with its glandular and pulmonary manifestations, while Dr. Bovaird covers the abdominal localizations, and Dr. McCarthy contributes a section on tuberculous meningitis. Dr. Nicoll presents a very complete chapter on diphtheria, including intubation and tracheotomy. The use of antitoxin is very fully considered and concise directions as to indications, administration, and dosage are given. It is one of the most comprehensive presentations of the subject to be found in any text-book now before the profession. Scarlet fever, measles, rubella, varicella, vaccinia, and variola all treated most satisfactorily by Floyd M. Crandall, of New York, and are illustrated by colored plates and numerous half-tones, many of which are taken from Welch and Schamberg's beautiful photographs. The colored plate depicting the appearance of the measles eruption is the best we have seen.

Section VII, on diseases of the respiratory tract, covering ninety-eight pages, is from the pen of Clive Riviere, of London. It is well handled and serves to indicate that there is little difference between the present-day English and American practice in the treatment of pulmonary diseases in childhood. Section VIII, on diseases of the heart and bloodvessels, is also contributed by an English author, F. John Poynton, of London. This is an admirable monograph especially valuable for its comprehensive consideration of the treatment. Section IX, diseases of the genitourinary system (why has it become fashionable to drop the hyphen and produce a word like *genitourinary*?), is a concise presentation of the subject by Charles G. Jennings, of Detroit. We are pleased to note that Dr. Jennings draws adequate attention to the condition now generally known as acute degeneration of the kidney and makes a careful distinction between it and acute nephritis, with which it is so fre-

quently confused. It is to be regretted that the subject of phimosis and its treatment without circumcision is not referred to. Section X, diseases of the blood, lymphatic system, and glands, covering fifty-two pages, is contributed by John Ruhräh, of Baltimore. It is a clearly drawn and well-balanced exposition of this difficult subject, well suited to the needs of a text-book for the general practitioner.

Section X, of over 100 pages, comprises a very complete description of diseases of the nervous system, by D. J. McCarthy, of Philadelphia. The author has very cleverly succeeded in writing from the standpoint of the pediatricist rather than from that of the nerve specialist, and his contribution is a model of what such a section should be.

A short section describing the more common diseases of the skin, which the child's physician is usually called upon to treat, by Charles Townsend Dade, of New York, finishes the volume. Lack of space alone seems to have necessitated the restriction of this section to a paltry thirty pages, of which eczema naturally receives a third. Dr. Dade's matter is so satisfactorily presented, however, that we could have wished for a more comprehensive assignment of space to cover diseases necessarily omitted.

A careful review of the volume as a whole convinces us that this is one of the notable books of the year, which must take a high rank among the numerous recent text-books on this important and increasingly popular department of medicine. T. S. W.

THE PRACTICE OF GYNECOLOGY. BY AMERICAN AUTHORS. Edited by J. WESLEY BOVEE, M.D., Professor of Gynecology in the George Washington University, Washington, D. C. Pp. 800. Philadelphia and New York: Lea Brothers and Co., 1906.

THE contributors to this Practice of Gynecology, seven in number, are men of prominence in the profession, their work is authoritative, and the able performance of the editor has produced a very readable volume. The whole subject of the diseases peculiar to women has been covered; in addition chapters upon diseases of the rectum and the urinary system have been included, the editor rightly considering them to form an integral part of the subject. Bovée contributes the mentioned chapters, together with a description of the developmental anomalies of the generative organs and a well-considered chapter upon sterility. Chapters on extrauterine pregnancy, the examination of the pelvic organs, and the technique of major operations are contributed by X. O. Werder. J. Riddle Goffe considers menstruation, uterine displacements, abdominal

operations from the standpoint of after-treatment and complications, and the technique of the vaginal method of operating. This last chapter is by far the best exposition of the subject of which we have any knowledge. G. H. Noble describes at length fecal and urinary fistulæ, and lacerations of the perineum. Inflammations of the uterus, cervical lacerations, uterine inversion, fibroid tumors of the uterus, and malignant disease of the uterus are discussed by G. B. Miller. The anatomy of the pelvic organs and diseases of the tubes and ovaries not dependent upon infection are described by B. R. Schenck, while T. J. Watkins, in a chapter of one hundred pages, presents the infectious diseases of these organs.

While multiple authorship of scientific volumes may have certain disadvantages, it has this undoubted advantage: if the distribution of subjects be well done, that the authors write from experience of matters in which they themselves are interested in a special degree—whence there is bound to be a greater infusion of the personal element in their book-work than can be the case when a single author prepares the whole volume. Of course, there is some danger that personal preference for certain subjects may result in undue prominence, with a resultant neglect of other portions important to the general reader; but here the censorship of the editor will, if well exercised, act as an efficient corrective. The present work is well balanced to a degree reflecting great credit upon contributors and editor, and is, as has been said, a very readable book—a very important recommendation. Opinions are expressed, it is true, which may be an occasion of disagreement among purely gynecological readers, as for instance the prominence given to the vaginal method of dealing with many of the conditions considered. The importance attached to shortening of the uterosacral ligaments in the correction of retrodisplacements of the uterus will not meet with the approval of many men of experience in this field; but we believe that any unprejudiced reader will agree that there is a refreshing fairness in presentation. The chapter on the vaginal method of operating will be found particularly pleasing as an exposition of this technique, irrespective of the individual opinions a reader may possess.

We wish that the Mengé pessary had been noted in the consideration of the treatment of inoperable uterine prolapse, and that atmokausis had been considered as a possible method of treatment of non-malignant uterine hemorrhage. We must differ with the statement that hysterectomy is indicated in cases of prolapse after the menopause, and believe that more insistence should have been placed upon plastic work in this connection. In the section devoted to septic infections of the endometrium there is no mention of the value of blood cultures from the standpoint of diagnosis, except with regard to the differentiation from malaria and typhoid fever; and while the use of antistreptococcic serum is advised, there is

no definite information offered with regard to its indications or dosage. The foregoing, however, are the only unfavorable criticisms which the book deserves, and these may be, in great part, the result of personal bias.

The book is directed more to the needs of the general practitioner than to the operator, although there is much of interest to the latter. As a whole, it is so good that it is difficult to select any chapters for special mention, but we feel that readers will be particularly pleased with the contributions of Bovée, of Werder, and of Goffe.

W. R. N.

THE PROPHYLAXIS AND TREATMENT OF INTERNAL DISEASES.

By F. FORCHHEIMER, M.D., Professor of the Theory and Practice of Medicine and of Clinical Medicine, Medical College of Ohio, University of Cincinnati. Pp. 652. New York and London: D. Appleton & Co., 1906.

THE contents of this book are arranged in the manner rendered familiar by the ordinary practice of medicine; first, the parasitic diseases, then the intoxications, and constitutional diseases, and finally, the diseases of the various systems. The book is to be commended, first, because the subject of diagnosis has been entirely omitted; too frequently in books of this class the temptation is to introduce a considerable amount of irrelevant matter; second, because throughout the work a clear distinction is made between measures designed to eliminate or combat the cause of the disease, and those which have for their object merely the relief of certain symptoms. Doubtless the therapeutic measures which are advocated will be acceptable in their entirety to very few. Some distrust that which is new, and will consider Dr. Forchheimer too radical; others, perhaps too credulous, will insist that many modern suggestions have been omitted or praised too faintly. On the whole, it is our impression that the middle course has been maintained with considerable success. The modern methods of treatment which seem rational have been given with some fulness of detail. Those which promise less, but are supported with some weight of authority, are at least mentioned. It is also made sufficiently clear that a good many of the older methods of treatment are at best merely expectant. It is a matter for praise that the text has not been burdened with a series of formulæ. A sufficient number of these have been collected in an appendix at the end, which also includes a list of drugs, and a table of the composition of food materials, and of alcoholic drinks.

Certain general criticisms may justly be made. The author's style is careless. On the whole, his meaning is sufficiently clear,

and there are no gross errors in grammar, but throughout the text there are numerous repetitions, words are used incorrectly, and sentences are improperly combined or divided. On almost every page there are minor errors of construction which can only be corrected by the context. Moreover, the author is unnecessarily prolix in his treatment of the subject. All that is said could have been more clearly and satisfactorily stated in fewer words. This leads to another criticism, and that is that the book is unnecessarily large and heavy, particularly in these days of thin, opaque paper.

Of the different sections, that upon the infectious diseases is probably the most satisfactory; that upon diseases of the digestive system probably the least so. The book has obviously been written for the general practitioner who desires fairly precise and definite statements upon the subject, and does not care to have thrust upon him the responsibility of choosing from all the various methods of treatment that have been suggested by authority. In the fulfilment of this object Dr. Forchheimer may be regarded as successful, and the book, therefore, deserves commendation. J. S.

GALLSTONES AND THEIR SURGICAL TREATMENT. By B. G. A. MOYNIHAN, M.S. (Lond.), F.R.C.S. Second edition. Philadelphia and London: W. B. Saunders & Co., 1905.

THE fact that this is the second edition of this work within a year shows what its reception by the profession has been. Like all others which have come from the pen of the author, it possesses the greatest practical value to the surgeon. It is a complete discussion of gallstones and is written in an easy comprehensive style. The whole subject, including etiology, pathology, symptoms, and treatment, is gone into very carefully and thoroughly, and the text is frequently elucidated by reports of cases and by excellent illustrations, most of which are original. One of the attractions of the book is the systematic way in which everything is discussed. An interesting discussion of Courvoisier's law is presented and the author enumerates the possible exceptions to it. Every complication of gallstones is considered separately with its symptoms and treatment. The later chapters deal with the various operations in the treatment of gallstones and their complications. This portion is a very thorough and most excellent guide to the operating surgeon. J. H. G.

OPHTHALMIC NEUROMYLOGY. A STUDY OF THE NORMAL AND ABNORMAL ACTIONS OF THE OCULAR MUSCLES FROM THE BRAIN SIDE OF THE QUESTION. By G. C. SAVAGE, M.D., Professor of Ophthalmology in the Medical Department of Vanderbilt University; Author of "New Truths in Ophthalmology," 1893, of "Ophthalmic Myology," 1902; Ex-President of the Nashville Academy of Medicine; Ex-President of the Tennessee State Medical Association. Thirty-nine full-page plates and twelve illustrative figures. Nashville, Tenn. Published by the Author.

This is an attempt to connect conditions presented by the ocular muscles with their related centres in the brain. The discussion is based upon clinical study rather than upon histological demonstration. Incidentally certain questions connected with the eyeballs as rotating bodies, *e. g.*, the location of the poles and axes of rotation, are taken up, and views commonly entertained are shown to be defective or even erroneous.

The book contains much that is suggestive, but it is not easy reading. The author's desire, as he states, "to help make the ocular muscle problem easy of solution," may have been furthered by this volume; if so, the subject itself must be, as it no doubt is, a difficult one. Close attention is required to discover the author's meaning and we are not sure that we have always succeeded. The reader who purposes to read this book will do well to prepare himself by preceding study of the anatomy and physiology of the ocular muscles and their numerous anomalies. The fact that such knowledge is indispensable or of great assistance in the comprehension of his meaning is, of course, no criticism, nor are the remarks so intended, upon the author's study of ophthalmic neuromyology.

T. B. S.

INFLUENCE OF THE MENSTRUAL FUNCTION ON CERTAIN DISEASES OF THE SKIN. By L. DUNCAN BULKLEY. Pp. 108. New York: Rehnman Co., 1906.

THE subject of this book, discussed by an author so well and favorably known as Dr. Bulkley, is worthy of close attention. Studies of this kind based upon clinical observation enable us to comprehend certain diseases of the skin regarded as obscure in origin, some of which are grave and rebellious to treatment. Like

all work emanating from this author the investigations presented are searching and complete, the subject being reviewed, as it should be, from an all-around standpoint. It has long been, and is today, too much the custom for observers to see the lesions of the skin and nothing beyond the skin; but the causes of the lesions are more important than the eruption itself, and this the author directs attention to and elucidates. Everywhere throughout the little volume cases are brought forward in substantiation of the position taken, so that one cannot read the pages without being convinced that the etiology of cutaneous diseases in general rests frequently upon factors far removed from the skin. Disturbed menstruation is accountable for a number of the commoner, and some of the so-called rare, diseases of the skin, and these are all considered and discussed in an interesting manner.

The clinical material, personal and of other observers, presented is large and varied, and the number of references to the literature of the subject is extensive. The book should be in the hand of every physician working in general medicine, as well as in the library of every one interested in cutaneous medicine. It is a book to be read and to be referred to. In no other memoir or volume is the whole subject presented in so thorough, concise, and attractive a manner. A full bibliography is appended.

L. A. D.

THE EYE, ITS REFRACTION AND DISEASES. DISEASES OF, AND OPERATIONS UPON, THE EYEBALL AND ITS ADNEXA. By EDWARD E. GIBBONS, M.D., Assistant Surgeon to the Presbyterian Eye, Ear, and Throat Hospital; Demonstrator and Chief of Clinic of Eye and Ear Diseases in the University of Maryland, Baltimore. Volume II. New York: The Macmillan Co., 1905.

THE second volume of this work treats of the diseases of the eye and its adnexa, taking up the different structures in order, beginning with the embryology of the eye and the anatomy of the eyeball and its appendages. Special chapters are devoted to ophthalmic migraine, associated diseases of the eye and ear, and eye lesions in general disease. The descriptions of disease forms, views as to etiology, treatment, etc., are quite in accordance with present-day opinions. There is nothing novel or very striking, but such of course is hardly to be looked for in a book dealing with what must necessarily be common property. The writer does not hesitate to express his opinion even when it is opposed to the ordinary views, as when he condemns the use of Buller's shield as a protective of the unaffected eye in gonorrhœal oph-

thralmia, an opinion in which the reviewer fully joins. We are inclined to doubt, however, whether a complete cure of convergent squint is established by glasses in 10 per cent. of all cases. Is tuberculous meningitis the most common brain lesion giving rise to an "ocular paralysis?"

T. B. S.

IMMUNITY IN INFECTIVE DISEASES. By ELIE METCHNIKOFF, Foreign Member of the Royal Society of London; Professor at the Pasteur Institute, Paris. Translated from the French by FRANCIS G. BIXNIE, of the Pathological* Department, University of Cambridge. Cambridge: The University Press, 1905.]

METCHNIKOFF'S book on immunity cannot be reviewed. It must be read. When the work was first published three or four years ago it was so much talked of, discussed, and extensively quoted that the general trend of the book is at least known to most readers, and indeed familiar to many. In it Metchnikoff gives his ideas regarding the complex questions of immunity, at the same time discussing the opinions and experiments of other observers. The book is made up of a wealth of details systematically arranged and brilliantly presented. The translation is literal, so, of course, none of the intrinsic value is lost, but in spite of a painstaking and careful translation much of the charm of the original is wanting. An alphabetical index has been added to the table of contents. Marginal references are given to the pages of the French edition so that one may with ease refer at any time to the original work. The editor has had a difficult task which he has done well.

W. T. L.

GREEN'S ENCYCLOPEDIA AND DICTIONARY OF MEDICINE AND SURGERY. Edited by J. M. BALLANTYNE, M.D. Vol. I. Aachen to Braxy. Pp. 538. Vol. II. Bread to Ear. Pp. 528. Edinburgh and London: William Green & Sons, 1906.

THESE are the first two volumes of a projected series of ten in which the attempt is made to combine the advantages of an encyclopedia of medicine with those of a medical dictionary. The subject matter is arranged alphabetically—the longer encyclopedic articles as well as the short dictionary definitions. The encyclopedic matter consists in large degree of articles originally published several years ago in the *Encyclopedia Medica*—revised and brought up to date; additional articles have been written by competent authorities. Among the articles of special value are those dealing with the

abdomen, abortion, adrenal glands, alcohol, alkaloids, anemia, anesthesia, aneurysm, ankle-joint, anthrax, aphasia, arteries, balneology, blood, bone, brain, bronchitis, burns and scalds, chest child, chlorosis, climate, colon, convulsions, deformities, diabetes, diet, digestion, digitalis, diphtheria, dysentery, and the ear. Excellent features of the book are the syllabi of contents introductory to many of the longer articles, and the cross-references introduced in profusion, in connection not only with the dictionary matter but also with the longer encyclopedic articles. The dictionary feature of the book seems incomplete, inasmuch as it comprises definitions only—etymology (singularly), orthographical variants, and pronunciation being omitted. Dr. Ballantyne, in addition to exercising general editorial supervision, has written most of the articles less than thirty lines in length, has added much new matter (indicated by brackets), and has prepared all of the dictionaryal as distinguished from the encyclopedic material. The work has been well done, and in general we may say that the first two volumes gives promise of a series of superior merit that can be cordially recommended to the general practitioner.

A. K.

A TEXT-BOOK OF PHYSIOLOGICAL CHEMISTRY FOR STUDENTS OF MEDICINE. BY JOHN H. LONG, M.S., Sc.D., Professor of Chemistry in Northwestern University Medical School, Chicago. Illustrated. Philadelphia: P. Blakiston's Son & Co., 1905.

IN an elementary manner this book tells the story of the complicated subject of physiological chemistry, avoiding as much as possible discussions upon the more intricate problems in the metabolism of the body. To deal thus with a growing subject, in which many questions are unsettled and some are scarcely more than opened for investigation, is a difficult task; and indeed it is almost impossible at times to sum up the results of work along certain lines in a single paragraph without giving a false impression as to the security of the conclusions. This is the principal fault with the book, and one that is difficult to avoid in an elementary work. An outline is presented of gastric and intestinal digestion, the chemical processes which go on in the liver, the chemistry of blood, milk, feces, and urine, with an introductory chapter upon the chemistry of carbohydrates, fats, and the protein substances. The importance of the action of ferments is recognized throughout the work. A very short discussion upon immunity is added. In appropriate places laboratory experiments illustrative of the phenomena described in the text are given in small type. The book can only be recommended to those who wish but an outline of the subject.

W. T. L.

DOSE-BOOK AND MANUAL OF PRESCRIPTION-WRITING, WITH A LIST OF THE OFFICIAL DRUGS AND PREPARATIONS AND MANY OF THE NEWER REMEDIES WITH THEIR DOSES. By E. Q. THORNTON, M.D., PH.G., Assistant Professor of Materia Medica, Jefferson Medical College of Philadelphia. Third Edition. Philadelphia and London: W. B. Saunders & Co., 1905.

IN the third edition of this manual the author brings the work up to date and conforms to the dosage of the eighth (1905) revision of the United States Pharmacopœia. The first part of the book is devoted to prescription writing. Tables of comparisons between English weights and measures and those of the metric system with methods of transposing them are given. Instructions as to the correct writing of Latin prescriptions and the ground-work of Latin grammar, as far as it pertains to the subject, is pretty thoroughly gone over. The solubilities of different drugs, their incompatibilities, and best forms of administration are included. A list of the official and non-official drugs and their doses occupies the main part of the work. Withal it is a quite satisfactory manual. A. N.

A MANUAL OF OTOTOLOGY. BY GORHAM BACON, A.B., M.D. With an Introductory Chapter by CLARENCE JOHN BLAKE, M.D. Fourth edition. Illustrated with 134 illustrations and 11 plates. Pp. 485. New York and Philadelphia: Lea Brothers & Co., 1906.

THE present edition of Bacon's *Otology* presents a number of valuable additions—to the text and to the illustrations. This is particularly true of the portion of the book which deals with the anatomy of the labyrinth. There are several entirely new figures which illustrate the anatomy of the labyrinth better than almost any of which we are cognizant. Another noticeable addition is a short appendix in which are described the methods of preparing smears and cultivations from discharging ears, and also the physiological inoculation experiments for the recognition of the tubercle bacilli in the pus. Dr. Bacon has the art of presenting the meat of his subject in such a concise, direct way that the book, even with the additions made to it in the course of the four editions through which it has passed, is even yet not a very bulky volume. We know of no manual which can in any way compete with it for general excellence of design and matter. The present edition shows evidence of very careful revision throughout. F. R. P.

PROGRESS OF MEDICAL SCIENCE.

MEDICINE.

UNDER THE CHARGE OF

WILLIAM OSLER, M.D.,

REGIUS PROFESSOR OF MEDICINE, OXFORD UNIVERSITY, ENGLAND,

AND

W. S. THAYER, M.D.,

PROFESSOR OF CLINICAL MEDICINE, JOHNS HOPKINS UNIVERSITY, BALTIMORE, MARYLAND.

Percussion of the Spinal Column.—V. KORANYI (*Ztschr. f. klin. Med.*, 1906, ix, 295) calls attention to the fact that he described the paravertebral triangle of dulness, which is commonly known as Grocco's sign, as early as 1897, the article appearing in a Hungarian treatise, as well as in the thirteenth volume of Eulenberg's *Encyclopedia*, third edition. He observes, however, that Grocco's description was unquestionably wholly independent of his own. He then discusses his studies on the percussion of the spinal column, as a result of which he concludes that a study of the percussion note over the vertebrae enables one to separate five distinct zones. On percussion over the spinous process the individual vertebra acts apparently in the manner of a plessimeter, the sound which is brought out depending upon the anatomical condition of the organs lying in front of the vertebral column, and especially those organs adjacent to the body of the vertebra to which the spinous process belongs. The percussion note heard over the vertebral column has a certain individuality, and it may be entirely different and independent from that brought out by percussion of the neighboring intercostal spaces, the abdomen, etc. Pathological changes in the organs surrounding the vertebral column may give rise to a change in the vertebral resonance. This change has a certain symptomatic and diagnostic worth representing, in some cases, the only physical sign of disease. The increase or diminution of the pathological changes in the diseased organ may be determined in some cases by vertebral percussion. The reliability of these signs depends, of course, upon the integrity of the

vertebral column. The various pathological changes of the spine interfere with the normal resonance. In the communication a number of interesting cases are mentioned to support these conclusions, the result being set forth in a plate.

Severe Anemia without Bone-marrow Regeneration.—HIRSCHFELD (*Berl. klin. Woch.*, 1906, xliii, 545). Severe anemias, whether secondary or primary, are practically always associated with marked and distinctive changes in the marrow. As the case belongs to either of these groups the metaplasia is normoblastic or megaloblastic usually, a mixed type with normoblasts or megaloblasts predominating, although rarely a practically pure type prevails. These characteristic changes are, however, occasionally absent and the fatty marrow may display no tendency to be transformed into red marrow, and, indeed, in some instances the marrow is almost completely disintegrated and destroyed. The first fully reported case of severe anemia without bone-marrow regeneration was contributed by Ehrlich, and he predicted the autopsy findings from the blood picture. Hirschfeld collects in all ten cases from the literature and adds two of his own. In all of these instances there is a marked reduction in hemoglobin and the number of red cells, the two running about parallel, so that there is no high color index. Changes in form and size are not marked. Nucleated red cells were not present, except in two of the cases in which an occasional normoblast was found. The leukocytes are remarkably few in number—600 in one case—and the lymphocytes greatly increased: Ehrlich's case, 80 per cent.; Engel's, 90 per cent.; Kurpjuveits, 68 per cent. Clinically, the cases are very acute and are marked by a strong hemorrhagic tendency. At autopsy the organs show the characteristic picture of a grave anemia, but the condition of the marrow varies. In the reports of Ehrlich and of Black there is noted a complete absence of the usual transformation of fatty into red marrow in the shafts of the long bones. As nothing is said about the condition of the short bones, Hirschfeld assumes there must have been no gross change. In other cases, besides the persistence of yellow marrow in the long bones, there were atrophy and degeneration of the marrow of the ribs, it being transformed into a red, watery liquid, exceedingly poor in cells. Besides normoblastic and megaloblastic anemias there is then a third group which Pappenheim has called paralytic or asthenic. As a rule, the blood picture reflects the changes going on in the marrow. There are, however, numerous exceptions, and Senator reports a case in which the clinical picture and blood findings led to the belief that the yellow marrow was not transformed, while autopsy revealed a complete lymphadenoid metaplasia.

Leukemia without Leukemic Blood.—EWALD (*Berl. klin. Woch.*, 1906, xliii, 870) reports an unusual case which carries with it many suggestive points in the classification and grouping of the severe anemias and leukemias. The patient, a man aged thirty-seven years, entered hospital after a six weeks' illness, with intense anemia, a very large spleen, and practically no glandular enlargement. Death occurred five days, with gradually increasing weakness. The history and

physical examination suggested leukemia, but the most careful blood examinations failed to show any of its characteristic features. There was a marked oligocythemia, but excepting this cytopenia there were no changes in the red or white cells. The leukocytes were not increased in number, their proportion was: polynuclear cells, 71 per cent.; large lymphocytes, 2 per cent.; small lymphocytes, 21 per cent.; myelocytes, 3 per cent.; transitionals, 3 per cent.; eosinophiles, absent. On an average, 740,500 red, and 800 white blood corpuscles were counted to the c.mm. On the fourth day in the hospital the hemoglobin was 28 per cent. Autopsy showed the typical anatomical picture of leukemia with characteristic changes in the marrow and organs. Marrow smears contained a large number of typical myelocytes, a few lymphocytes, and only an occasional nucleated red blood corpuscle. How shall such a case be classified? It may be contended that the leukemic blood picture has been suppressed by an intercurrent infection, a not infrequent occurrence, but the report of a blood examination made at another clinic two weeks before admission to the hospital shows that there had been no gross changes at that time. Neither the clinical course nor the blood picture nor the autopsy findings permits a grouping with the anemias. Pappenheim speaks of an aleukemic period of leukemia, but in this instance the leukemia blood picture never arrived. More and more cases of atypical anemias and leukemias are being reported, and the question of classifying these has led to much discussion. Ewald's case resembles most one reported by Hirschfeld as atypical myeloid leukemia.

Diabetes and Pneumonia.—GLAESSNER (*Wien. klin. Woch.*, 1906, xix, 896). The occurrence of an acute infection in patients with glycosuria frequently increases either temporarily or permanently the output of sugar. It has long been known that febrile infections favor the occurrence of alimentary glycosuria. In some instances, however, the acute infectious disease has a decidedly beneficial influence. Bamberger reports a fall to one-tenth of the previous amount during typhoid fever. After an attack of pneumonia Goolden's patient passed only one-third liter of urine with a specific gravity of 1012, while before he had passed twelve liters of a specific gravity of 1048. Glaessner reports a similar occurrence in a woman aged fifty-four years. On admission to the hospital she was passing over four liters of urine of a specific gravity of 1030 and containing 2.97 of sugar. With the onset of a mild pneumonia the amount of sugar rapidly dropped and acetone disappeared from the urine. During convalescence, the amount of sugar was further decreased and finally it completely disappeared. After three months of observation it had not returned, and it failed to reappear even after the administration of 100 grams of grape sugar.

SURGERY.

UNDER THE CHARGE OF

J. WILLIAM WHITE, M.D.,

JOHN RHEA EARTON PROFESSOR OF SURGERY IN THE UNIVERSITY OF PENNSYLVANIA;
SURGEON TO THE UNIVERSITY HOSPITAL,

AND

T. TURNER THOMAS, M.D.,

ASSISTANT SURGEON TO THE UNIVERSITY AND PHILADELPHIA HOSPITALS, AND ASSISTANT
INSTRUCTOR IN SURGERY IN THE UNIVERSITY OF PENNSYLVANIA.

The Interval Operation in Appendicitis.—HAGEN (*Zentralb. f. Chir.*, April 14 1906) says that for several years he has practised the following rule: From the third day he has delayed operation in non-progressive cases whenever he is able to keep a constant watch over the patient, and is in a position to operate immediately, if alarming symptoms appear. It is, therefore, important to have such a patient in a hospital. Patients showing a progressive tendency or a general septic appearance within the first two days are to be operated on immediately, and the earlier the better. The intermediary stage, that is, between the second and the fifth day, is the most dangerous period. While he has been accustomed, previously, to operate in this stage without exception, in the last year, fourteen patients were carried through this stage by expectant treatment. An inflammation, evidently circumscribed and non-progressive in character, can become diffused, owing to the operation itself, without a fault in the asepsis and with all proper precautions.

Fracture of the Lower End of the Radius with Dislocation Forward of the Head of the Ulna and Tearing-away of its Styloid Process.—MOUCHET and GENIL-PERRIN (*Revue d'Orthopédie*, May 1, 1906) believe that in their case the fracture of the lower end of the radius resulted in a tearing off of the styloid process of the ulna, and that this facilitated very much the forward dislocation of the head of the ulna. All the classical symptoms of a Colles' fracture are, of course, present; so that it will not be overlooked. The swelling of the wrist, however, will easily obscure the dislocation of the ulna. We should always suspect a lesion of the lower end of the ulna in all fractures of the lower end of the radius. If the condition occurs before the disappearance of the epiphyseal lines, an epiphyseal separation will frequently be present, and the interference with growth in the radius may cause a forward dislocation of the ulna, which continues to grow. Complete reduction of the fractures and the dislocation should be obtained under ether, if necessary, and should be maintained afterward. When the disturbance of function from an unreduced dislocation is considerable, excision of the head of the ulna may be done.

Passive Congestion in Acute Inflammation.—LEXER (*Zentralb. f. Chir.*, May 5, 1906) credits Bier with the statement that the streptococcus is rarely present in acute suppuration. In Lexer's experience the streptococcus alone and mixed with the staphylococcus is not rare. Not only

did the passive congestion treatment fail in these cases, but frequently it aggravated the local condition. He suggests that his colleagues make bacteriological examinations in all their cases, and report their results.

Intestinal Obstruction from a Hernia in the Foramen of Winslow.—JEAN-BRAU and RICHE (*Revue de Chirurgie*, May 10, 1906) have made a very extensive study of this subject. They say that the diagnosis of this condition carries with it the necessity of a laparotomy in most cases. Only two contraindications are recognized: lack of sufficient assistance and an exhausted or too weak condition of the patient. It is then better to make an enterostomy in the first coil of distended intestine that presents, and when the condition of the patient ameliorates, to do a laparotomy. When this is being done a large incision is necessary, and if an enterostomy has not been made, a preliminary enterotomy to relieve the distended bowels of gas should be done. Other forms of obstruction can then be quickly eliminated by sight and touch. Reduction of the strangulation in the foramen of Winslow is accomplished by gentle and prolonged traction on the engaged coils, grasping them with a compress to avoid contusion from the fingers. Division of the constricting ring is a dangerous procedure and according to the writers is possible only at the lower margin of the foramen.

Primary Intestinal Anthrax in Man; Septicemia; Hemorrhagic Leptomeningitis.—TEACHER (*Lancet*, May 12, 1906) says that the points of interest in his case are as follows: it appears to be an example of that form of the disease, most common in animals but rarest in man, in which infection occurs through the alimentary canal. It was extremely virulent and rapid, the whole duration being twenty hours. Anthrax in this case was never suspected until the postmortem revealed the hemorrhagic condition of the meninges. Moreover, the case seems to be completely isolated.

Contribution to the Study of Traumatic Ruptures of the Bladder.—MOREL (*Annales des Maladies des Organes Genito-Urinaires*, June 1, 1906) reports four cases of traumatic rupture of the bladder, three intraperitoneal ruptures without fracture of the pelvis, and one subpubic extraperitoneal rupture with a double vertical fracture of the pelvis. Of the three intraperitoneal ruptures, one patient was struck by a locomotive, another was suffering from general paralysis, and the third received a blow on the abdomen. The patient with general paralysis, and the one having a fractured pelvis died, the other two recovered. Morel calls attention to two important clinical features present in his intraperitoneal cases, and not noted by the classical authorities: (1) The persistent uniform capacity of the bladder, and (2) the manner in which the bladder may be refilled after complete evacuation by the catheter. The first is explained by the fact that the rupture is situated in the upper part of the bladder, the lower part of which still acts as a reservoir. When the urine reaches the level of the rupture it escapes into the abdominal cavity. Repeated catheterization will, therefore, withdraw each time about the same quantity of urine, but it does not influence the urine in the abdominal cavity. The second symptom is due to a change in position from the recumbent, in which the urine is

evacuated by the catheter, to the upright, in which the bladder is immediately refilled by the urine which has escaped through the rupture into the lower part of the abdominal cavity, and which now as readily returns to the bladder. By cadaveric experimentation Morel was assured of the constancy of this symptom. He believes that in his case with general paralysis the degeneration of the muscle at least favored the rupture. He calls especial attention to two etiological factors in these cases, the tolerance of the bladder which can be distended to the point of rupture, and the degeneration of the muscle which causes a diminished resistance to distention.

On Spontaneous Cure of Cancer.—GAYLORD and CLOWES (*Surgery, Gynecology, and Obstetrics*, June, 1906) reach the following conclusions from an extensive and very interesting study of this subject: (1) Spontaneous cure of cancer in the experimentally inoculated mice occurs, in their experience, in about 23 per cent. of the animals. (2) The chances of spontaneous cure are, inversely, proportional to the size of the tumor; the frequency of the occurrence and its distribution in animals suggests that it may be more frequent in human beings than is generally supposed. (3) The occurrence of spontaneous recoveries from cancer, indicating the existence of immune forces capable of terminating the disease, demonstrates that cancer is not necessarily incurable, and should serve as an additional stimulus to research directed toward the discovery of a serum-therapeutic treatment.

The Treatment of Acute Inflammations by Bier's Method.—DEPAGE (*Journal de Chirurgie et Annales de la Société de Chirurgie*, June, 1906) showed three cases favorably influenced by this treatment and one case of severe paronychia of the little finger, which involved the tendon sheath, and consecutively the palm of the hand. In spite of incisions, drainage, counteropenings, and the application of Bier's treatment, the infection continued and in three days the patient was in a condition of general pyemia. Hendrix presented one case in which a spina ventosa had been curetted and treated by the bandage. The result was apparently satisfactory. Another case of caries of the olecranon was operated on. In four days the Bier bandage was applied and healing occurred by first intention. Verneuil, Maffei, and Desguin thought that the results in these cases were not conclusive and that similar results can be obtained without the Bier treatment. Hendrix admitted this but claimed that the results from this treatment were more rapid.

A Contribution to the Pathology of the Thyroid Gland.—KOCHER (*Brit. Med. Jour.*, June 2, 1906) says that he would not accept the diagnosis of exophthalmic goitre in the absence of the characteristic swelling of the gland and the vascular symptoms at the beginning. He considers that one of the earliest symptoms of the disease is a sudden retraction of the upper lid when the patient is made to look suddenly at one, or to look upward suddenly. He has had fourteen cases of vascular goitre under treatment; four have been treated internally, ten have been operated on, either by ligature or excision on one side, and all have been cured. He has seen seventy-two cases in which the Basedow changes had been, so to speak, grafted on the common form of colloid goitre, and which should be separated from the more severe, typical

cases of Basedow's disease. Of these sixty have been operated on without one death. Of seven patients there is no news to be had; two are better, and fifty-one are cured. In thirty-two cases the operation consisted of excision of one side, in eight cases of excision of one side and one ligature on the opposite side, in three cases of excision of one side and partial excision of the other, in four cases of ligation of both superior arteries, in six cases of ligation of the two superior and one inferior artery. Of the typical Basedow's or Graves' disease, he has operated on one hundred and six cases. There have been nine deaths; five patients have died later of different affections, partly without any relation to the disease; six have had tetany after the operation without a death; seven are better than before the operation; nine are greatly or even extraordinarily improved; sixty-two are cured, and in thirty-four of these the cure is perfect. Excepting the nine patients who died, there has been no patient who has not in reality been benefited a great deal by the operation.

Combining the typical and severe, and the milder and beginning forms, he has had a total of 175 operations, with nine deaths, equal to 5 per cent.; a cure or extraordinary amelioration in all milder forms, and in 70 per cent. of the severe cases. He considers that with such statistical results we must admit that the disease is not a neurosis, but a disease localized to the thyroid gland, with the removal of which the source of the mischief is taken away. Practically the most important fact is that Graves' (Basedow's) disease means a thyrotoxic affection in opposition to cachexia thyreopriva.

We may state positively that overactivity of the thyroid gland would, for one reason or another, be quite sufficient to explain the appearance of the symptoms of Graves' disease, and their disappearance after operation. Operation should be done before organic changes have developed in the heart, which were present in all the fatal cases. Judicial medical treatment before operation should be carried out, the most important features of which are small doses of iodine for a short time, continuous use of phosphates, and absolute mental and bodily rest.

A New Method of Performing Gastrotomy.—TAVEL (*Zentralb. f. Chir.*, June 9, 1906) says that methods like the Witzel, Marwedel, Kader, and Kuster II, while they provide a more or less long passage, are not lined with mucous membrane or skin, and tend to close unless a sound is left in more or less permanently. The canal is small, and besides, the stomach is fixed to the abdominal wall, so that the function of the stomach is interfered with. Tavel has tried his new method successfully on three dogs, and on one man for an impassable stricture of the œsophagus. Under morphine-ether anesthesia an incision 10 cm. long was made, two-thirds above, and one-third below the umbilicus. A loop of intestine, 15 cm. long, in the region of the jejunum having a long mesentery, was isolated, by dividing it at both ends. This portion was then placed in a moist towel, while the two cut ends of the intestine were brought together and sutured, so that its continuity was restored. The anal end of the isolated piece of intestine, which was marked by a forceps, was passed through an opening in the mesocolon and omentum, and anastomosed to the anterior wall of the stomach, its stomach end being fixed in the abdominal wound, which was sutured around it. Except for a slight pneumonia at the base of

the right lung, healing occurred without accident. Two weeks after the operation the patient was fed with solid food. An artificial œsophagus about 15 cm. long, from the skin surface of the abdomen to the stomach, is thus provided, which does not permit the expulsion of food on coughing or straining.

THERAPEUTICS.

UNDER THE CHARGE OF

REYNOLD WEBB WILCOX, M.D., LL.D.,

PROFESSOR OF MEDICINE AND THERAPEUTICS IN THE NEW YORK POST-GRADUATE MEDICAL SCHOOL AND HOSPITAL; VISITING PHYSICIAN TO ST. MARK'S HOSPITAL,

ASSISTED BY

HENRY HUBBARD PELTON, A.M., M.D.,

INSTRUCTOR IN MEDICINE IN THE NEW YORK POST-GRADUATE MEDICAL SCHOOL AND HOSPITAL;
CHIEF OF THE MEDICAL CLINIC, PRESBYTERIAN HOSPITAL DISPENSARY, NEW YORK.

Bile in Gastrointestinal and Hepatic Disorders.—M. NIGAY (*Revue de Therapeutique*, 1906, 387) considers that extract of ox-gall is very useful in these affections. Bile is the most puissant cholagogue at our disposal, and in therapeutic dosage is non-toxic. The toxic elements of bile are the pigments, and these may be eliminated. Bile has a field of therapeutic application in gallstone disease, jaundice, hepatic insufficiency, cholemia, etc. It is also effective in dyspeptic disorders, particularly in constipation and enterocolitis. His favorite preparation is the extract of ox-gall, the minimum dose of which is from $7\frac{1}{2}$ to 15 grains administered in pill form after meals. In extreme instances it may be necessary to give as large a quantity as 75 grains, but such doses should not be continued. The pills should be coated with keratin or similar substance, so that their contents may not be set free until they reach the intestine. The patient should be advised to drink more than the usual amount of water in order that the increased quantity of bile which is excreted as a result of the medication may not become inspissated; it is often wise in this connection to give euonymin or podophyllin in combination with the bile extract. If any infectious condition is present, salol may be added.

Therapeutics Based on Pathological Physiology.—R. C. CABOT (*Boston Med. and Surg. Jour.*, 1906, clv, 57) concludes a paper under this title as follows: Treatment based on pathological physiology is neither the best nor the worst type of therapeutics. It occupies a position intermediate between etiological treatment and symptomatic treatment. It is based on theories of the nature and trend of the body's reaction against the *materies morbi*, theories which must be constantly and empirically verified. Empiricism is not a type of treatment, but an essential element in all treatment, nevertheless theory is invaluable because it supplies the motive power of most scientific progress. Empirical

verification guides but does not initiate this progress. Treatment that aims to remove the cause of disease should neglect very largely the individual factors in the case, but treatment based on pathological physiology can be effective only by considering the physical and psychological peculiarities of each individual and his relations to his family, his work, his education, and his environment. Etiological or symptomatic treatment must first ascertain at what spot in the organism the trouble resides. To that spot its energies should be directed, but treatment based on the individual's manner of reacting to the disease must study the whole individual so far as it can discover him.

The Fresh Air Treatment of Pneumonia.—J. M. ANDERS (*Med. Record*, 1906, No. 1, p. 1) extends a plea for the employment of fresh air in the treatment of pneumonia, which is based upon the premises that an atmosphere containing the full complement of oxygen is demanded in this disease in which a large proportion of the air cells are rendered functionless, and that a calming effect is exerted upon the nervous system and refreshing sleep is induced by cold air. The appetite and digestion also noticeably share in the beneficent influences of this natural agency. Under the influence of low temperature the heart's action becomes slower, the pulse tension is increased, a tonic effect is exerted upon the cutaneous nerves and vessels, and indirectly the tendency to internal congestion is lessened. The respiratory function is stimulated and more oxygen is absorbed. The fresh air treatment should not be undertaken without due deliberation upon the peculiarities of the subject in hand. Thus, in certain forms of secondary pneumonia it might be inadvisable, as, when pneumonia supervenes in Bright's disease or in highly nervous persons, etc. In general it may be said that this form of management is only exceptionally contraindicated, and among the beneficial effects observed from the constant breathing of fresh cold air are a better general condition, increased appetite, lessened cough, diminished temperature, pulse-rate and respiration-rate; in short, a less-marked toxemia than is observed in patients treated by more usual methods.

Antitoxin in Late Diphtheritic Paralysis.—M. COMBY (*La Semaine médicale*, 1906, No. 25, p. 295) reports an instance of diphtheritic paralysis which occurred a month after a specific angina in a child aged four years. All four limbs and the pharynx were affected and a rapid and complete recovery followed the administration of four injections of serum which were given during the course of three days. During the subsequent discussion M. BARBIER stated that such paralyzes were often fatal and were most common in patients who had received too late or insufficient antitoxin treatment, and that the only means of relief for such individuals was the immediate institution of further antitoxin injections. M. GUINON cited two instances of late diphtheritic paralysis, one of which succumbed while the other rapidly recovered under antitoxin.

Hypodermic Injections of Strychnine in Diabetes Insipidus.—L. FEILCHENFELD (*La Sem. médicale*, 1906, 282), while treating a man aged sixty years for vesical paralysis by means of hypodermic injections of strychnine, noticed that the treatment caused a practical cure of the

polyuria, with which the patient was also affected. He also treated with success a second patient suffering from simple polyuria in the same manner. L. de Kéty has had recourse to the same mode of treatment in four instances of diabetes insipidus. In three of these, recovery resulted. The quantity of urine which had been from nine to eleven quarts in the twenty-four hours was diminished to from two to three quarts, and in two of the patients the specific gravity returned to normal. The beginning dose was 1/120 grain; this was gradually increased.

The Treatment of Migraine.—E. MENDEL (*Deut. med. Woch.*, 1906, No. 20, p. 785) states that diet regulation is important in the management of this affection. Meat should be allowed only once a day, tobacco and alcohol should be prohibited. A regimen of milk and vegetables with carbonated water will keep the bowels regular and will prevent attacks. With regard to climate an elevated region is to be preferred to the sea-shore. Lesions of the eyes, nose and genital system should receive appropriate treatment. Cold baths (68° F.) with friction act favorably in non-anemic patients. Prolonged galvanic and faradic treatment may be followed by cure. Arsenous acid, quinine and iron (in anemic subjects) may prove effective. The author highly recommends the following formula: Trinitrine 1½ grains, phosphoric acid and alcohol of each 2½ drams. Dose, two drops twice daily. In connection with this he advises the following powder to be taken after breakfast for three or four weeks: Sodium bromide 35 grains, sodium salicylate 4 grains, aconitine 1/600 grain. If the seizure commonly appears on rising, this powder should be taken at bedtime. Pyramidon, acet-phenetidine, or a mixture of lactophenine 7½ grains, and citrated caffeine 3 grains, are often serviceable. Morphine, if given at all, should be combined with atropine.

Feeding in Enteric Fever.—F. P. KINNICUTT (*Boston Med. and Surg. Jour.*, 1906, clv, 1) has analyzed a large number of statistics concerning the feeding of enteric fever patients, and concludes that intestinal accidents, hemorrhage and perforation are rather less frequent under a mixed, soft, and solid diet than under the restricted diet, consisting mainly of milk. The statistics available for an estimation of the relative frequency of relapses under restricted and more liberal diets, are not so large as those analyzed to determine the incidence of intestinal accidents, but they harmonize with the current view that diet has little influence in their causation. The influence of diet in causing recrudescences of fever, the author believes to be a real one, but due rather to abrupt changes in diet than to its quality. As a result of his study, he considers that a plea for a different dietetic management of enteric fever from that almost universally prevalent, seems justified. By this indiscriminate feeding is not meant, but rather a management adapted to the case in hand and based upon the recognition, (1) that while the digestive function in many instances is unquestionably seriously impaired, frequently the impairment is not a material one; (2) that a clean tongue, and hunger should be accepted as guides for the cautious employment of a more generous diet; (3) that the individual rather than the disease should be considered and treated. By such a management suffering may be avoided, prolonged disability materially modified, the danger of secondary infections more efficiently met, and a more rapid convalescence effected.

Massage of the Kidney in Renal Colic.—D. C. Woods (*La Sem. médicale*, 1906, xxiii, 270) reports an instance of renal colic in which he chloroformed the patient and, with the idea of facilitating the descent of the stone through the ureter, applied bimanual massage over this structure. Twenty-four hours later the stone was voided and the pain ceased. Two months later the patient had a similar attack upon the other side which was relieved in the same manner as was the first. The calculus was passed five hours after the massage and forty-eight hours after the commencement of the paroxysm. The author considers that in this mode of treatment we have an effectual mode of shortening the crises of renal colic.

Digalen.—L. VON KETLY (*Therap. Monatschrift*, 1906, No. 6, p. 272) concludes from his results with this drug, which is a soluble form of digitoxin, that when digitalis is indicated this preparation is superior to others. Its advantages over the galenical preparations are as follows: (1) It is always of uniform composition and action. (2) Its action is more rapid. (3) It has no cumulative effect. (4) It causes no gastric irritation. (5) It is most suitable for administration by the mouth in doses of 1/400 to 1/200 of a grain, one to three times a day, in water or syrup. (6) The drug is less applicable to hypodermic administration, since it may cause local irritation and acts no more rapidly than when given by the mouth. (8) In very severe instances of cardiac disease it may be administered intravenously. The action of the drug takes place in from three to six hours, diuresis is induced within twenty-four hours, and the effect persists for from one to two days.

OBSTETRICS.

UNDER THE CHARGE OF

EDWARD P. DAVIS, A.M., M.D.,

PROFESSOR OF OBSTETRICS IN THE JEFFERSON MEDICAL COLLEGE, PHILADELPHIA.

Infection in Septic Abortion.—SEEGERT (*Zeit. f. Geb. u. Gyn.*, 1906, Band lvii, H. 3) contributes a paper upon this subject from Olshausen's clinic in Berlin. In 15,000 cases of abortion fever occurred in 15 per cent. Of 633 patients, 182 had chills before they came under active treatment. Among the 15,000 patients were 450 who were severely infected; of these 94 died. In 82 cases autopsy was made. Those cases showed the most severe symptoms in which the longest time elapsed before the uterus was completely emptied. Fever often ceased when the uterine contents were expelled. These were cases of pure sapremia, in which the bacilli present were only mildly infective. It is of the utmost importance that no artificial wound be made in the lining membrane of the uterus. In these cases, neither incision nor forcible dilatation should be practised, but if necessary the cervix should be tamponed with gauze until the uterus is sufficiently open to permit the removal of its contents with the finger. No sharp instrument should

be employed in the treatment of abortion. If foetal or maternal tissue is retained and pathogenic germs gain entrance the case becomes septic. Bacteria soon enter the lymphatics and bloodvessels, and great care must be taken in treatment that in emptying the uterus these vessels are not disturbed. If the infection is limited to the connective tissue of the pelvis, the pelvic veins, or pelvic diaphragm, recovery usually follows; but if the bacteria overwhelm the organism, a very serious result follows. As examples of the most acute type, Seegert describes cases ending fatally within a week in which autopsy showed acute degenerative processes in the vital viscera. He also describes two cases in which gas-forming bacillus was present, gas being found in the blood and in the heart. When septic bacteria are especially active the uterine wall may be perforated, as in one of his cases, and at the point of perforation a purulent hematoma had formed. He also describes a group of five cases with septic endocarditis and secondary embolism; these patients seemed to do well at first, but perished three or four weeks after the infection. These cases resembled malignant endocarditis, and in most of them a piece of placenta had been retained. In thirty-one autopsies it was remarkable how little evidence there was of perforation or lesions of the genital tract. In six cases lesion was found, four of these being criminal, and in the two remaining there was complete perforation of the uterus. In five of these cases there was not only the lymphatic form of sepsis, but also the thrombophlebitic form. One is almost justified in concluding that a case of abortion showing pyemic symptoms with thromboses and metastases with exudate in the small pelvis has resulted either from criminal abortion or from some artificial wound in the genital tract. Attention is drawn to infection of the spermatic veins often extending to the vena cava. This was present in twenty-five cases: fourteen on the right side, five on the left, and six in both spermatic veins. In twelve cases there were thrombi in the perimetrium. Staphylococci were found in the blood in one case. In thirty-one cases septic metastases were present, in twenty-five in the lung. The majority of cases of pyemia, however, are satisfactorily dealt with without the ligation of the hypogastric and spermatic veins. Of seventy patients with pyemic infection, 61 per cent. recovered, although convalescence in some was greatly prolonged; 28.5 per cent. died, while others were transferred because of mental condition or left the hospital against the advice of physicians. The treatment consisted in the plentiful use of simple nourishing food and abundant alcoholic stimulation. In some cases quinine was used successfully by hypodermic injection. Neither serum nor collargol were used in the treatment of these cases. The lymphatic variety with its manifestations of general sepsis and septic peritonitis is also described. In these cases phlegmasia is often present. At autopsy the lesions are those of the endometrium, pelvic and abdominal peritoneum, and also of the lymphatics in other portions of the body.

Eclampsia during Pregnancy; Death from Suppression of Urine; Extensive Infarction of both Kidneys.—JARDINE (*Jour. Obs. Brit. Empire*, July, 1906) reports the case of a multipara, seven months pregnant, admitted to the Glasgow Maternity in eclampsia. The urine contained albumin with granular casts, and under treatment addressed to elimination the patient grew somewhat better. She expelled the

foetus and had convulsions after delivery, accompanied by jaundice. Labor was followed by almost entire suppression of urine; accordingly, the right kidney was exposed by incision and its capsule stripped and the kidney substance incised. There was very little bleeding. Ten hours after the operation the patient died. On autopsy the liver was pale and fatty; the kidneys enlarged; the cortex much diminished. The capsules of the kidneys were easily separated; the heart was fatty and the lungs were œdematous. On microscopic examination the cortex of the kidneys was the site of extensive infarction, associated with widespread thrombosis; the liver showed fatty infiltration.

Eclampsia during and after Labor; Recovery after about Two Hundred Fits.—JARDINE (*Jour. Obstet. Brit. Empire*, July, 1906) also reports the case of a multipara admitted to the Glasgow Maternity in convulsions. The patient gave birth spontaneously to a living child and seemed better; shortly afterward she was taken with violent convulsions which persisted for several days. She finally made a complete recovery. She was treated by bleeding, transfusion, the use of calomel, chloroform, chloral, bromides, and hot packs. The case is interesting and remarkable for the great number of convulsions, their severity, and the patient's recovery.

GYNECOLOGY.

UNDER THE CHARGE OF

HENRY C. COE, M.D.,
OF NEW YORK.

Results of Radical Operations for Cancer of the Uterus.—SCHINDLER (*Monats. f. Geb. u. Gyn.*, 1906, Band xxiii, Heft 4) reviewing the work of five years finds that 40 per cent. of his cases were suitable for radical operation. The primary mortality was 8 per cent. Over 50 per cent. of the patients had a recurrence within three years after operation. In all these the glands were affected. Schindler deplors the fact that in the majority of the cases the disease has progressed too far to admit of a cure by surgical means. He thinks that it is practically impossible to remove all the diseased lymph glands and vessels.

Hernia of the Ovary.—BIRNBAUM (*Berl. klin. Woch.*, 1905, No. 21) reports the case of a married woman, aged thirty-five years, who had never menstruated. She had had a left inguinal hernia from the age of five years, but could not wear a truss on account of local tenderness. The pelvic organs were of the infantile type. In the hernial sac was a tumor the size of a walnut which could be moved from the inguinal ring downward into the labium. On opening the peritoneal cavity an ovary and imperfect tube were found, together with a solid

rudimentary uterus, the right adnexa being absent. Histologically the ovary presented the foetal type, the superficial epithelium being absent. Birnbaum alludes to fifteen cases of hernia of the ovary collected by Küstner, and adds eight others which came under his own observation. The condition is in most instances congenital and is often associated with failures of development. Taxis is usually impossible, so that operation becomes necessary—either replacement of the uterus, or extirpation of the latter and ovary if the uterus is rudimentary.

Perforation of the Uterus.—TREUB (*Zentralblatt f. Gynäkologie*, 1906, No. 28) reports the two following cases of perforation of the uterus:

CASE I.—A woman in order to interrupt pregnancy, introduced into the uterus a bougie, which she left *in situ* for some time while she attended to her work. When she tried to remove the instrument only the knob on the end came away. Three weeks later she entered the clinic with slight bleeding, but no fever. A fluctuating tumor was felt above the symphysis with some resistance in the cul-de-sac. On incising a preperitoneal abscess, the bougie was removed.

CASE II.—A woman who had passed over her period eight days introduced a catheter into the uterus, and being unable to find it again entered the clinic three days later. A mass could be felt in Douglas' pouch, but on incising posteriorly nothing could be palpated. The uterine cavity was dilated and explored but the catheter could not be felt. The curette removed some decidual membrane. The patient's temperature rose and a swelling appeared over Poupert's ligament on the right side, in which the catheter was found to be imbedded.

Hemorrhagic Endometritis.—GOTH (*Monatschrift f. Geb. u. Gyn.*, 1906, Band xxiii, Heft 5) calls attention to the fact that the first menstruation after curetting is usually delayed, probably due to the protracted renewal of the endometrium. Hemorrhagic endometritis is most common during the period of sexual activity, and is usually accompanied by hypertrophy of the endometrium in nulliparæ, hyperplasia being most common in those who have borne children. The histological character of the endometritis is not influenced by disease of the uterus or adnexa

Fibroma of the Ovary.—LOSINSKI (*Russki Vratsch; Zentralblatt f. Gyn.*, 1906, No. 29) reports the case of a girl, aged sixteen years, with a solid abdominal tumor accompanied with moderate ascites. The tumor was a fibromyoma of the left ovary, weighing over a pound. The writer commenting on the presence of smooth muscle-fibers, believes that they are derived from the utero-ovarian ligament and the middle coat of the small arteries. He alludes to forty-nine cases collected by Basso.

Gonorrhœal Infection of the Urinary Tract in the Female.—KNORR (*Zentralblatt f. Gyn.*, 1906, No. 30) bases his deductions on cystoscopic examinations of upward of 3000 patients, extending over a period of seven years. He is fully in accord with Bunn with regard to the frequency of gonorrhœal cystitis and ascending infection. While the urethra and neck of the bladder are often infected, pure gonorrhœal

inflammation of the body of the organ is very rare, and is then likely to be circumscribed. The cystoscopic picture is one of congested areas or petechiæ. This appearance is by no means pathognomonic, however.

Other observers have had a similar experience with regard to the infrequency of vesical infection. No satisfactory explanation of this fact is offered. Gonorrhœal pyelitis is still more rare, and is usually due to secondary infection, from catheterizing the ureters. Gonococci have been found in the kidneys in a few cases, but these may have made their way through the lymph channels. As regards therapy, Knorr recommends applications of nitrate of silver in urethritis, weak solutions being injected into the bladder if that organ is affected. The injection of a solution of nitrate of silver into the pelvis of the kidney, as recommended by Kelly, is advisable only in a protracted case.

Degeneration of Uterine Fibroids.—PIQUAND (*Thèse de Paris; Zentralblatt f. Gyn.*, 1906, No. 31) from a study of 200 specimens arrives at the conclusion that over 30 per cent. undergo degeneration, especially between the ages of forty and forty-five years. Hence, the inference that while the menopause may lead to an improvement in the symptoms, or to a diminution in the size of the tumor, in a considerable proportion of the cases degenerative changes are to be expected. Early operation is accordingly advised.

Tuberculous Ovarian Cysts.—RENNY (*Thèse de Lyons; Zentralblatt f. Gyn.*, 1906, No. 34) adds a case to the seventeen already reported. He states that the diagnosis can be made only after bacteriological examination of the cyst. Infection of the latter is always secondary to a tuberculous peritonitis or salpingitis. If no source of infection can be found the cyst was probably infected through the bloodvessels.

Mortality in Uterine Fibroids.—PELLANDA (*Thèse de Lyons; Zentralblatt f. Gyn.*, 1906, No. 34) in analyzing 171 fatal cases found that 5.2 per cent. of the patients died from cachexia, 6.4 per cent. from hemorrhage, 49.5 per cent. from sepsis, and 25.8 per cent. from obstruction of the intestines or ureters. 11.1 per cent. succumbed from thrombosis and embolism or cardiac disease. The average age of the deceased was forty-four years and nine months.

Pulmonary Complications after Laparotomy.—BIBERGEIL (*Archiv. f. Chirurgie*, Band lxxviii, Heft 2) observed 283 cases after 3909 abdominal sections. The most frequent condition was bronchopneumonia, referable to aspiration during narcosis. Lobar pneumonia was rare, probably due to infection with the pneumococcus in the contents of the mouth or to development of the micro-organism already in the lung, on account of the weakened power of resistance of the patient. Bibergeil is skeptical with regard to the relation of pneumonia to infection within the abdominal cavity. As prophylactic measures he recommends thorough cleansing of the mouth and fauces before anesthesia and irrigation of the stomach previous to gastrointestinal operations. The patient should be protected from cold, her position changed frequently after operation, and she should be allowed to sit up as soon as possible.

DERMATOLOGY.

UNDER THE CHARGE OF

LOUIS A. DUHRING, M.D.,

PROFESSOR OF DERMATOLOGY IN THE UNIVERSITY OF PENNSYLVANIA.

AND

MILTON B. HARTZELL, M.D.,

ASSOCIATE IN DERMATOLOGY IN THE UNIVERSITY OF PENNSYLVANIA.

The Treatment of Eczema.—W. ALLEN JAMIESON (*Edinburgh Med. Jour.*, March, 1906) speaks first of many different causes that may give rise to eczema, and emphasizes the fact, admitted by practically all observers, that there is no specific for this disease. He regards arsenic as "of little or no use in the treatment; in acute cases it tends to aggravate; in chronic it rarely, if ever, benefits. The disease occurs independently of either gout or rheumatism, and has no necessary connection with these diseases." Contrary to the observation of most of the best clinicians in the United States, Jamieson holds that in the treatment we must rely chiefly on external means, and these are consequently considered at length. The points to be constantly kept in mind are (1) cleanse; (2) soothe; (3) cautiously stimulate. As the field is large, the author confines himself to a few of the common local forms, as eczema of the leg, scalp, and palms. The cold starch poultice, spread out in a layer one inch thick, but separated from the skin by a layer of muslin, and both covered by any impervious material, is well spoken of for eczema of the leg, and also of the palms. It should be renewed four times in twenty-four hours, and not allowed to become dry and hard. All crusts are to be removed before applying. Afterward diachylon ointment or Startin's ointment, composed of ammoniated mercury and black sulphide of mercury each gr. x, precipitated sulphur gr. xxx, camphor gr. iv, may be used.

An ointment of oxidized pyrogallie acid and salicylic acid, of each gr. x, lanolin 5j, vaselin 5ij is also recommended, well rubbed into the skin twice daily. At first this blackens the entire surface, but as healing, takes place only the still diseased portions become discolored. Jamieson cautions against the use of oxide of zinc ointment. If used it should be freshly prepared, and he advises making it with cold cream ointment and gives the following formula: lanolin and white wax each 5ss, almond oil and distilled water each 3ss. With this zinc oxide, bismuth oxide, or prepared chalk may be incorporated in proportions to suit the case.

Dermatitis Venenata.—E. S. McKEE (*Lancet-Clinic*, January 6, 1906) gives his experience in two cases, both occurring upon his own person, and speaks in particular of the treatment, the attacks being severe and long. The most useful remedy was a lotion of dilute alcohol together with a saturated solution of acetate of lead, which would give relief in four or eight hours. Bathing in the hot lake at Mammoth Hot

Springs, Yellowstone Park, on one occasion, gave complete and permanent relief. These waters are impregnated with silicate of magnesium. Many of the well-known remedies, as phenol, in different strengths, gave temporary relief, but are not to be compared with the efficacy of dilute alcohol, especially if used early in the attack, and with dilute alcohol and acetate of lead. The nervous symptoms, entirely apart from the local itching and burning, were distressing and long continued in one attack.

Two Cases of Erythema Multiforme Desquamativum.—PHILIP KING BROWN (*Boston Med. and Surg. Jour.*, February 1, 1906) gives the notes of two interesting cases under the above caption, the general symptoms being marked in each, especially heart involvement. In both, there was a history of recurrent endocarditis. Both boys had abdominal pain and vague rheumatic histories. The cases were peculiar in that there occurred desquamation similar to that of scarlet fever, and in one case, purpuric lesions. The general symptoms were varied and numerous; these are all referred to by the author, and constitute the chief interest of the paper.

Eruptions Produced by the Bromides and Iodides.—ARTHUR HALL (*Edinburgh Med. Jour.*, May, 1906) discusses the varieties of cutaneous disease caused by these drugs. He prefers employing Unna's terms of "iododerma" and "bromoderma" (rather than "acne") to express the eruptions, with the adjectives erythematosum, purpuricum, pustulosum, tuberosum, as required. The more severe forms due to iodides usually occur in persons suffering from diseases of the kidney, either alone and primary, or secondary to, or complicated by, heart disease, a defective power of elimination probably being the predisposing cause. In the case of bromides, the more severe forms of eruption occur chiefly in young children or infants whose eliminative powers are not manifestly diminished. Both the severe iodide and bromide eruptions may follow extremely small doses of the drug, administered for extremely brief periods; and, secondly, they continue to develop and get worse after the use of the drug has been entirely discontinued. They then remain severe for some time and very slowly disappear. The practical point in the paper (which is made interesting by illustrative cases) is the risk of giving iodide in any form, or any dose, to patients with diseased kidneys, or of giving bromide, in however small doses, to infants for long periods.

The Pathology and Therapeutics of Mycosis Fungoides.—VON ZUMBUSCH (*Archiv f. Dermatologie und Syphilis*, Band lxxviii, Hefte 2 und 3), who has studied five cases of mycosis fungoides, observed in Riehl's clinic, regards this disease as akin, in a certain degree, to leukemia and pseudoleukemia, especially on account of the blood changes observed in it; these blood changes are, however, not the same as those seen in these two affections. They appear only during the course of the disease, being absent in the early stages. Mycosis fungoides may resemble sarcoma, and in this case blood changes may be entirely wanting. One is not justified in identifying it with leukemia or pseudoleukemia, and it belongs just as little to sarcoma. It is to be regarded as an independent disease, for its course and the clinical picture it pre-

sents are characteristic, and the histological features are uniform and peculiar. As to the therapy of the malady, only two remedies are to be seriously considered—arsenic and the *x*-rays. The author regards the latter as a very valuable form of treatment, which, although it cannot prevent death taking place eventually, is able to bring about a decided temporary improvement.

Necrotic Polymorphous Erythema in Acute Nephritis.—POLLAND (*Archiv. f. Dermatologic und Syphilis*, Band lxxviii, Hefte 2 und 3) reports the case of a man aged sixty years, with chronic leg ulcers, who, during an attack of acute nephritis, suffered from a polymorphous erythema, accompanied by hemorrhages and hemorrhagic blebs. In some of the blebs necrosis of their bases occurred without injury of their covering and without bacterial infection. At the same time, infection of the leg ulcers with bacilli of gangrene took place, and from these a number of opened blebs became infected and were transformed into large ulcers. Unopened blebs, which had escaped infection, healed without any great loss of substance.

OPHTHALMOLOGY.

UNDER THE CHARGE OF

EDWARD JACKSON, A.M., M.D.,
OF DENVER, COLORADO,

AND

T. B. SCHNEIDEMAN, A.M., M.D.,
PROFESSOR OF DISEASES OF THE EYE IN THE PHILADELPHIA POLYCLINIC.

Rupture of the Choroid.—KRÖNER (*Archiv. f. Augenheilk.*, August, 1906) calls attention to the rarity of this accident. Large statistics show that it occurs about once in a thousand patients with ocular complaints. The rupture is usually produced by some blunt force acting directly upon the eyeball itself or the neighborhood thereof, or perhaps even through a concussion of the whole body. The most usual form is that in which the rupture, in the shape of a white line or band, nearly parallels the circumference of the papillæ on its temporal side. Double concentric ruptures are much rarer; still more rarely does the choroid tear in a direction radial to the papilla. Of 289 cases collated by Pohlenz and Ohm the rupture was single in about 70 per cent., double in about 16 per cent., radial in about 10 per cent., and in only 7 per cent. was the latter combined with a concentric tear, equal to a single instance in 15,000 patients. Much more rare than the linear are surface ruptures. Outside of the thirteen such cases collected by Pohlenz out of forty-six instances of choroidal rupture (undoubtedly an accidental excess) and of which six were combined with a circular tear, only a few are to be found in literature. The re-

porter records one such involving both choroid and retina and best described by the term "coloboma-like" rupture. He also reports a case of double circular combined with radial rupture.

Artificial (Suction) Hyperemia in Ocular Therapeutics.—HESSE (*Centralb. f. prak. Augenh.*, June, 1906), referring to Bier's method of artificial hyperemia as a therapeutic agent and its rapid adoption in every department of practical medicine, calls attention to the fact that ocular therapeutics forms an exception; not that attempts have not been made to render artificial hyperemia serviceable in the treatment of diseases of the eye, for REXNER (*Münch. med. Woch.*, 1906, No. 11) has attempted to produce hyperemia of the eye and its adnexæ by means of a rubber band around the neck and has observed what influence such "congestion" may exert upon various diseases of the eye. According to his observations this method of treatment exercises a favorable influence upon interstitial keratitis, to the extent that the cornea seemed to clear up more rapidly; in *ulcus serpens*, also, a favorable influence seems to be exerted, while eczematous and catarrhal ulcers and inveterate, corneal opacities appear to be uninfluenced. Renner's method, however, is not a satisfactory one in that it cannot be localized to the desired region nor accurately dosed. Its application may be, and has been, accompanied by certain undesirable consequences. For localization and dosing, Hesse has devised a special instrument consisting of a sort of dry cup made of glass, about 30 cm. in circumference; the free border is constructed to correspond to the margin of the orbit; a stout india-rubber tube is adjusted to the other extremity of the cup; the tube terminates in an india-rubber bulb, compression of which produces a partial vacuum. The bulb may be replaced by a suction pump. To cause the desired effect a pressure difference of 20 to 50 mm. Hg. is necessary. This can be readily attained by the apparatus. With 100 mm. Hg. conjunctival hemorrhage occurred in the writer's own eyes. For accurate measurement a T-tube manometer may be employed.

Applied to the closed lids, at the expiration of five minutes, the skin was strongly reddened and somewhat œdematous; after half an hour there was a bluish discoloration with increased œdema. The margins of the lid became slightly everted, swollen, and reddened. The effect upon the deeper parts was very slight. When the cup is applied to the open lids the effect is different. The lids present the same changes as before, but the deeper parts are also affected. The palpebral conjunctiva becomes strongly hyperemic and swollen. The bulbar conjunctiva shows at first vascular dilatation followed by a serous accumulation beneath the conjunctiva beginning at the fornix; in one-half hour the fluid has advanced to the margin of the cornea and presents the picture of an intense chemosis. The cornea becomes involved also; it appears œdematous and its surface is slightly dulled. The iris showed no visible changes in man; in the rabbit the pupil became decidedly smaller and the structure of the iris slightly obliterated, no doubt due to increase in volume from an excess of fluid. Involvement of the deeper vascular system was shown by the marked ciliary injection. No changes could be observed in the lens, vitreous, or retina. The tension was unaffected.

Under pathological conditions of the eye, especially vascular formations, increased filling of the vessels and succulence of the tissues were observed. The effect upon the deeper vessels in interstitial keratitis was the same, that is, increased fullness.

Hesse concludes from these observations and experiments that the new method is worthy of trial in numerous inflammatory diseases, phlegmon, furuncle, etc., dacryocystitis, blepharitis, the various forms of conjunctivitis, especially phlyctenular, and trachoma. Of diseases of the cornea it seems especially applicable in ulcers of whatever origin, perhaps also for the clearing of pannus or in interstitial keratitis in which condition the vascular formation would be furthered, a circumstance supposed to precede recovery. The influence upon the ciliary system of vessels and the increased secretion into the anterior chamber raise the hope that it may be of use in deeper inflammations, like iritis and cyclitis.

Glioma of the Retina.—AYRES (*Archiv. of Ophthalm.*, July, 1906) reports 4 cases of this disease occurring in female children of about the same age, twenty to thirty months. Enucleation was performed in all. Three were cured and 1 died two weeks after operation. One is now fourteen years of age and in good health, a second is eight years of age and well, and in the third, ten months have elapsed since the operation and the child is perfectly well. Of 36 cases, in 60 patients, of glioma of the retina, reviewed by Collins, there were 8 living three to nineteen years after operation, including 2 cases of double enucleation; 6 more patients were known to be alive, but they had not yet reached the three-year limit. The same author appends a list of 25 successful cases in the hands of other oculists. Marshall continues the report of Collins: of 32 patients, 15 had exceeded the three-year limit, including 5 from whom both eyes had been removed. Of 467 cases described by Wintersteiner, 49 per cent. occurred in the first two years of life, 67 per cent. in the first three years—these include the congenital cases, which constitute about 7 per cent. of the entire number. The latter are possibly more numerous than these statistics show, being overlooked by lack of careful examination. The ophthalmoscope alone would reveal the earlier stages.

Dionin in Ophthalmic Practice.—HINSHELWOOD (*Brit. Med. Jour.*, May 12, 1906) has made extensive use of dionin introduced by Darier as an ocular analgesic, and is impressed with its great value in ophthalmic practice. Dionin (ethyl-morphine hydrochloride), a white, odorless crystalline powder freely soluble in water, may be employed, in 5 per cent. aqueous solution, or made up with vaselin as an ointment. It does not render the cornea or conjunctiva insensitive, and hence is of no use for the removal of foreign bodies or operations of any kind; but if pain the result of disease is present, dionin has a markedly soothing effect for several hours. It is not an anesthetic but a powerful analgesic. It neither dilates the pupil nor increases the tension. It can do no harm. After the first instillation it may cause a feeling of burning irritation followed by an intense chemosis; this need not cause the slightest alarm, as it rapidly subsides. It may be welcomed as the analgesic effects of the drug seem greatest

when it occurs. It never reappears after the first or second instillation. It is well to begin with a 2 per cent. solution, and gradually increase the strength to 5 per cent. and even more. The powder itself has been used with great relief, only, however, after the eye has become thoroughly accustomed to it.

In 1 or 2 per cent. solution it is often successful in neurotic and neurasthenic patients who complain of ocular discomfort without discoverable disease or abnormality, as well as in ocular pain the result of eye-strain.

It has also a remarkable action in clearing up corneal opacities of recent origin, to which no other method can be compared; even in old-standing opacities improvement may result. Hinshelwood uses it here in an ointment. In keratitis with much infiltration he combines it with atropine. When the inflammatory symptoms have subsided the atropine is stopped but the dionin is continued for some time.

DISEASES OF THE LARYNX AND CONTIGUOUS STRUCTURES.

UNDER THE CHARGE OF

J. SOLIS-COHEN, M.D.,
OF PHILADELPHIA.

Frontoethmoidal Sinusitis with Spontaneous Evacuation upon the Face.—ST. CLAIR THOMSON (*Revue hebdomadaire de laryngologie, d'otologie, et de rhinologie*, June 30, 1906) reports three cases of frontoethmoidal sinusitis with spontaneous evacuation in the orbital region. The first case occurred in a woman, aged eighteen years, after an attack of influenza. The abscess pointed at the inner angle of the left eye. The symptoms were those of ethmoido-frontomaxillary suppuration. Incision and evacuation of the pus was followed by complete recovery without any other operation. The second case occurred in a lad only nine years of age, in an institution for boys, and had followed a cold; coryza and moderate amygdalitis were prevalent at the institution. The sinus was frontal and the abscess presented upward. Recovery followed incision of the abscess, and exposure and drainage of the frontal sinus. The third case occurred in a woman, aged thirty-five years, and was one of chronic sinusitis with acute frontoethmoidal exacerbation. A fistula in the upper portion of the right orbit communicated with an anterior frontoethmoidal cell. Contrary to expectation, serious radical measures became necessary to control the disease, and recovery required several months of subsequent treatment.

Fatal Osteomyelitis after Radical Operations for Diseases of the Accessory Sinuses.—CLAUQUE (*Arch. internationales de laryngologie, d'otologie, et de rhinologie*, May-June, 1906) presented to the Congress of the French Society of Laryngology, Otology, and Rhinology the cranium

of a patient who died with a progressive osteomyelitis which began two days after a Caldwell-Luc operation. Dr. Durand, of Nancy, at the same meeting, reported the case of a young albuminuric and tuberculous girl with sinusitis and upon whom a radical frontomaxillary operation had been performed. One month later a second operation was instituted in consequence of a frontopalpebral oedema with severe general symptoms inexplicable by any organic lesion. A focus of osteomyelitis was discovered occupying the entire frontal bone. Torticollis of the right side developed at the same time, rapidly followed by coma and death with pulmonary symptoms. On autopsy thrombosis of the superior longitudinal and the lateral sinus were found; these had provoked the formation of a digastric abscess.

PATHOLOGY AND BACTERIOLOGY.

UNDER THE CHARGE OF

WARFIELD T. LONGCOPE, M.D.,

DIRECTOR OF THE AYER CLINICAL LABORATORY, PENNSYLVANIA HOSPITAL,

ASSISTED BY

G. CANBY ROBINSON, M.D.,

RESIDENT PATHOLOGIST, PENNSYLVANIA HOSPITAL, PHILADELPHIA.

A Study of Epidermal Fibers.—THOMPSON (*Jour. Exp. Med.*, 1906, viii, 467) announces his discovery that sections of skin stained by appropriate methods show definite fine fibrils in the cells of the stratum germinativum which serve to bind together the cells of the stratum filamentosum. To demonstrate these fibrils the tissue is fixed in Zenker's fluid; sections which have first been mordanted in potassium permanganate and oxalic acid are stained for twelve to twenty-four hours in phosphotungstic acid hematoxylin. The fibers are present in the skin of certain animals and in man under conditions of increased cell activity. The increase, moreover, seems to be in direct ratio to the rapidity of cell production. In the rapidly growing epithelium about the margins of ulcers they were present in great numbers. Thompson believes that the process of fiber production by the cells of the human epidermis is analogous to increased fiber production by various other cells under similar conditions, and may be of importance in identifying or classifying new-growths of epithelial origin.

Pathological and Etiological Observations upon Arthritis Deformans.—RIMAN (*Arbeiten a. d. path. Inst. z. Berlin*, 1906, p. 139) has examined the knee-joints of one hundred bodies at autopsy, excluding all joints which presented outward signs of disease, and has found in sixty-seven cases changes in the cartilage and bones which he classifies as two types of arthritis deformans. The first type, arthritis deformans hyperostica, is characterized by excessive growth of the articular surfaces

and synovial membrane. The second type, arthritis deformans atrophica, is characterized by regressive changes in the cartilage and bone, which indeed is common to both varieties, but is completely lacking in the productive alterations. The conditions are often associated with a fibrous metaplasia of the bone-marrow, the bone, and the cartilage. This metaplasia is, however, much more common and much more extensive in the atrophic variety. Transition stages between the two varieties are seen. The changes are regarded as a local reaction to a pathological stimulus which results from a severe general infection of the body. Both types have the same etiology and are most frequently associated with tuberculosis or carcinoma. The hypertrophic type is a disease of elderly people, is rarely seen before the forty-fifth year, and is more frequently seen in men than in women; the atrophic type is a disease of youth and middle age, rarely occurs after fifty-five years, and is more frequent in women.

Aortitis and Spirochetæ Pallida.—An important finding has been made by REUTER (*Zeit. f. Hyg. u. Infekt.*, 1906, 49) which strengthens the idea regarding the syphilitic origin of a certain type of aortitis associated particularly with the names of Döhle and Heller. In a characteristic specimen of this variety of aortitis, which involved the ascending arch of the aorta of a man who died from occlusion of the coronary artery, Reuter found, by using Levaditi's method of staining sections, typical examples of spirochetæ. They lay not in the media but in the thickened intima. No definite history of syphilis was obtained, but a scar was discovered at autopsy on the prepuce. In view of the increasing evidence to show that *Spirocheta pallida* is the cause of syphilis, Reuter considers that the presence of the organism in this peculiar type of aortitis strengthens the opinion that the condition is syphilitic in nature. To show that the spirochetæ may be present in tertiary lesions he describes a case in which the organisms were found in great numbers in a gumma of the lung.

Fermentative Fat-splitting in the Stomach.—HENISHEIMER (*Arbeiten a. d. path. Inst. z. Berlin*, 1906, p. 506) records a number of experiments to show that the glands of the stomach secrete during digestion, a ferment body which is capable of splitting neutral fats. To determine the amount of fat which is split he has used the Volhard method. This consists in mixing the gastric juice with egg-yolk, digesting with a few drops of toluol at 37° C. for twelve to twenty-four hours, extracting with ether and alcohol, and determining the acidity of the ethereal extract. All observations were controlled with boiled gastric juice. The experiments were carried out upon dogs with the various Pawlow's fistulæ. By this means the influence of regurgitating intestinal and pancreatic juices was excluded. The results of the experiments showed that the gastric juice contained a fat-splitting ferment acting upon neutral fats best in an acid medium. The ferment is produced by the glands in the mucous membrane of the fundus. The lipase is present only in fresh gastric juice, for when the gastric secretion is kept for a short time, even on ice, the fat-splitting power disappears. The lipolytic action was also determined for human gastric juice. At least 25 per cent. of the neutral fat was split, and 20 per cent. of this was thought to be due to ferment action. The lipolytic action became more pro-

nounced with the increase of the gastric secretion. The lipase was decreased in a case of subacid gastritis, and absent in a case of achylia gastrica, and a case of carcinoma of the stomach.

The Pathology of Lymphatic Leukemia.—General opinion has changed from one viewpoint to another regarding the etiology and pathogenesis of lymphatic leukemia until at present arguments are being brought forward to show that the condition is allied to a tumor growth. GULLAND and GOODALL (*Jour. Path. and Bact.*, 1906, xi, 333) have recently studied ten cases of lymphatic leukemia and two cases of chloroma previously reported by Dunlap and Bramwell. They consider that acute and chronic leukemia are essentially the same condition, and that there is no histological difference between them and the affections known as chloroma. They point out that the bone-marrow is always extensively affected, while the incidence of lymphatic infiltration elsewhere is exceedingly varied. The spleen and lymph glands are most enlarged in the most chronic cases, whereas in some instances the lymph glands are uninvolved. In the lymph glands the germinal centres are generally absent and in the spleen the Malpighian bodies are atrophied. Arguing from these points and the observations of others, Gulland and Goodall conclude that the bone-marrow is the starting-point and essential seat of the disease. Actively proliferating cells from the marrow are carried by the blood to other tissues and organs, where they multiply actively, as may be seen in sections, and thus produce the packing of glands and infiltration of organs with lymphocytes. Even the formation of lymphoid new-growths in a variety of tissues may occur. The excess of cells is associated with phagocytosis of lymphocytes in glands, spleen, and other organs, including the marrow itself. By the excessive production of lymphocytes in the marrow the available space for red cell formation is crowded out. The decrease of the erythroblastic tissue gives rise to a smaller production of red cells and to a varying and frequently extreme degree of anemia.

Gulland and Goodall suggest that the bone-marrow proliferation is due to a disturbance of the mechanism governing cell production rather than to a response to chemiotaxis in the ordinary sense. The condition may thus be considered a disturbance in nutrition, which, in the present state of our knowledge, cannot be distinguished in its results from tumor growth, although the initial change is probably more widespread than is usual in ordinary tumor formation.

Schultz (*Ziegler's Beiträge*, 1906, xxxix, 252) from the study of a case of acute lymphatic leukemia comes to much the same conclusions. In his case the bone-marrow was most affected, and he considers that in this organ was the seat of the disease. The proliferating marrow cells arrive in the blood stream and are carried to the various organs. Where the conditions are favorable the cells proliferate in the organs, forming limitless tumors, which, on their part, produce cells and throw them out into the circulation, thus giving rise to a vicious circle.

Although Veszprini (*Virchow's Archiv.*, 1906, clxxxiv, 220) does not consider acute lymphatic leukemia as a true tumor, he likens the process in certain particulars to a new-growth. In three cases of the large-cell type he found the bone-marrow especially affected, and regards this organ as the original seat of the disease. A cell peculiar to the bone-

marrow, immature and not an adult lymphocyte, is the one which proliferates, and by casting elements into the blood, secondary tumor-like proliferating growths are formed in various organs.

Experiments upon Replantation of the Brain-substance.—SALTYKOW (*Arch. f. Psychiatrie*, Band xl, Heft 2) has excised and replanted successfully small portions of the cortex of the brain in forty young rabbits, in order to study the changes that take place in the isolated portion of brain-substance and in the surrounding nerve tissue. The operation, when done carefully and with rigid technique, may be accomplished without much injury to the health of the animal. The rabbits were killed at different periods after the operation. In the successful replantations, no infection occurred either in the meninges or the brain-substance. One might expect the replanted piece of brain-substance to undergo softening; but, on the contrary, it heals as any other tissue. The cellular elements of the replanted tissue remain for a time intact, show progressive changes, and finally the specific elements die. Well-preserved ganglion cells were seen on the eighth day after replantation. From the eighth hour on they showed progressive changes, noticeable in the swelling of the protoplasm, enlargement of the nucleus, and increase of the chromatin and nucleoli. On the eighth day definite mitoses were seen. The glia cells showed numerous mitoses on the seventh day, and were still present on the twentieth day after replantation. The bloodvessels of the replanted tissue presented, from the second and third days, abundant mitotic growth of the endothelial cells and of the perivascular cells. Later, the vessels connected with the newly formed vessels of the surrounding tissue. The nerve fibers degenerated or disappeared rapidly from the replanted tissue. The encapsulating connective tissue and that arising about the newly formed bloodvessels gradually replaced the replanted bit of brain-matter, remains of which could be found as granular masses on the seventy-eighth day after operation. Outside of this connective-tissue scar a zone of glia cells formed. The author considers that the much disputed question as to whether the ganglion cells of warm-blooded animals are capable of proliferation under suitable stimulus can be answered in the affirmative; for in the neighborhood of the wound, he saw, two to six days after operation, numerous mitoses in the ganglion cells, with division of the protoplasm. Newly formed nerve fibers were seen in the neighborhood of the wound, from the twenty-fifth day on, growing into the gliomatous scar. The author considers that the "Körnchenzellen" arise primarily from the perivascular cells, and finally, from preformed connective-tissue cells.

Cultivation of *Treponema Pallidum* de Schaudinn.—LEURIAUX and GEETS (*Cent. f. Bakt. u. Parasit.*, Orig., 1906, Band xli, p. 684) claim to have procured pure cultures of these spirochetæ from the cerebrospinal fluid of cases of secondary syphilis. In forty-two lumbar punctures they have obtained growths of the organisms three times. In thirty-eight cases the fluid was sterile, and once it was contaminated. One part of neutral bouillon was added to two parts of spinal fluid, and the mixture placed in the thermostat at 37° C. for three or four days. The liquid was then centrifugated for twenty minutes, and the slight sediment smeared over coagulated pork serum. The growth

appears at the end of two to four days, as an ivory-white moist film. In this medium the progress of the growth was studied. Smears made from young cultures showed, not a spirocheta, but small, oval bodies, which, if stained with the Giemsa method, corresponded very closely in form and dimensions to *Cytoryctes luis* of Siegel. During the development of the organism the form changes to one resembling a trypanosome, and after a new series of modifications assumes the form of the *Spirocheta pallida*.

The Relationship between Tuberculosis of Man and of Animals.—The question of the communicability of bovine tuberculosis to man is discussed again and at length by RABINOWITSCH (*Arbeiten a. d. path. Inst. z. Berlin*, 1906, p. 365), who for some time has been interested in this problem. She has made a comparative study of thirty strains of tubercle bacilli. Twenty-five of these strains were isolated from twenty cases of tuberculosis in man, while five were obtained from perlsucht infections in animals. The organisms could not be differentiated from their morphological appearances, nor from their relative pathogenic action toward guinea-pigs, for which animals they were exceedingly virulent. The differentiating points rested in their biological characteristics, and their pathogenic action toward rabbits. On culture media the bacillus of human type grows much more rapidly and luxuriantly than the bacillus of perlsucht, while the latter type of organism possesses a much higher grade of virulence for rabbits than the human bacillus. Rabinowitsch considers that these differences are sufficient to warrant a separation of the two types of bacilli, though the question as to how widely removed they are is still questionable. The important result of the work comes out in the classification of the organisms obtained from the cases of human tuberculosis. From two of these twenty cases bacilli were obtained which had all the characteristics of the cultures from the tuberculosis of cattle. One of these was a case of primary intestinal tuberculosis, one a case of feeding tuberculosis in a child. Of six atypical strains which did not correspond with the human type and yet were not typical of the bovine type, two were from cases of primary intestinal tuberculosis, one from a questionable case of feeding tuberculosis, and three from cases of miliary tuberculosis. Besides these strains, a bacillus was obtained from the caseous nodules in the spleen from a case of miliary tuberculosis, which, in its cultural characteristics and pathogenic properties (extreme virulence toward chickens, particularly in feeding) should be considered the bacillus of avian tuberculosis. From the remaining eleven cases typical bacilli of human tuberculosis were obtained. Rabinowitsch concludes that the bacillus of bovine tuberculosis is pathogenic for man and may give rise to extensive lesions and a fatal infection.

Etiology and Diagnosis of Hydrophobia.—WILLIAMS and LOWDEN (*Jour. Infect. Diseases*, 1906, iii, 452) present an extensive study of the "Negri bodies" and their relation to hydrophobia. From a study of numerous infected animals, dogs, cats, and human beings, they find that the three tests used, namely, a search for the "bodies" in smears, a search in hardened tissues, and by inoculation, correspond to one another as to diagnostic results, and the bodies were always found when the biological test was positive. In all animals inoculated from the

twenty-eight infected animals, the Negri bodies were found, and the authors consider that the presence of the bodies makes the diagnosis certain, even if the biological test is negative. They especially recommend the smear method, which they fully describe, for diagnostic purposes as well as for making a study of the bodies. The Negri bodies were never found by them in control animals. They believe that the Negri bodies are specific to hydrophobia, and consider the fact that the bodies are living organisms sufficient proof that they are the cause of hydrophobia. They say that a single variety of living organisms found in such large numbers in every case of a disease, and only in that disease, appearing at the time the host tissue becomes infective in regions that are infective and increasing in these infective areas with the course of the disease can be no other, according to our present views, than the cause of that disease. They consider that the characteristic definite morphology, which is constantly cyclic, together with the close resemblance of the bodies in structure and staining qualities to certain known protozoa, notably those of the sub-order microsporidia, is sufficient proof that they are living organisms. By the term constantly cyclic, they mean that certain forms always predominate in certain stages of the disease, and a definite series of forms indicating growth and multiplication can be demonstrated. Numerous bodies have been seen in fixed virus. Here they are usually extremely small, and the authors believe the organism may pass through the coarser Berkefeld filters. "Bodies" were found before the beginning of visible symptoms, *i. e.*, on the fourth day after fixed virus inoculation, and on the sixth day after street virus inoculation, and evidence is given that they may be found early enough to account for the appearance of infectivity in the host tissue.

Disseminated Tuberculosis in Relation to the Thoracic Duct and Vascular Tubercles.—WHIPPLE (*Bull. Johns Hopkins Hosp.*, 1906, xvii, 270) has examined for tubercle bacilli the fluid withdrawn from the thoracic duct in twenty-seven cases of tuberculosis, including nearly every type of the disease. The bacilli were found in both of two acute cases examined, in fourteen of nineteen cases of subacute tuberculosis with disseminated tubercles, but in none of six chronic cases with no disseminated tubercles. Except in one case the intima of the thoracic duct was healthy, while mesenteric lymph glands showed caseation in all positive cases. Intestinal ulceration was present in thirteen of the sixteen positive cases. Whipple believes that swallowed bacilli can pass through the intestinal mucosa, causing ulceration in the majority of cases, to form caseation of the mesenteric lymph glands, but can traverse the thoracic duct to the blood stream without injury of its intima. In the two acute cases of tuberculosis vascular foci were found and the author believes that in acute cases the bacilli are usually derived from such foci. Small vascular tubercles, he thinks, do not play an active part in disseminating bacilli, because during the greater part of their development they are covered by an intact endothelium which, if it ruptures or degenerates, is rapidly coated by a thrombus mass. This either occludes the vessel or is smoothed over, and then roofed in by a rapid overgrowth of endothelium. In these cases the bacilli usually reach the blood stream through the intestine, mesenteric lymph glands, and thoracic duct.

The Influence of the X-rays upon Metabolism in Chronic Myeloid Leukemia.—KÖNIGER (*Deut. Arch. f. klin. Med.*, 1906, lxxxvii, 31) has studied the metabolism of seven cases of chronic myeloid leukemia treated by the x-rays. Exposures were made, at first for five minutes, later ten to fifteen, and occasionally twenty to twenty-five minutes, over the splenic region at a distance of from 30 to 40 cm. from the skin. In his results he calls attention particularly to the changes in uric acid excretion. In all the cases a fall in the number of leukocytes of the circulating blood was accompanied by an increased output of uric acid, but when the leukocytes had finally obtained a low level the uric acid decreased and remained continually at a low figure. These two variations in the uric acid excretion he believes are caused by two different modes of action of the x-rays upon the tissue. First, the x-rays in some manner destroy the formed leukocytes and this increased tissue destruction is accompanied by an elevation in the uric acid output. Secondly, the x-rays inhibits the formation of leukocytes in the hemopoietic organs, so that the excess of cells once destroyed, the formation and breaking down of leukocytes is greatly reduced, and the quantity of uric acid excreted is low. A low uric acid excretion combined with a low leukocyte count is a favorable sign, and an elevation of the uric acid in the urine may point to a remission of the disease. Corresponding roughly to the changes in uric acid excretion, there were similar but transitory alterations in the amount of nitrogen and phosphoric acid in the urine.

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All communications should be addressed to—

DR. A. O. J. KELLY, 1911 Pine Street, Philadelphia, U. S. A.

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